Solicitation No. W912HV26BA009

**US Army Corps of Engineers**
**Japan District**

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# FY26 CABT184709 RENOVATE MFH TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN

# SPECIFICATIONS

## RTA Submittal

STATE OF MARYLAND
THOMAS CHRISTENSEN
92381
PROFESSIONAL ENGINEER
04.14.2026

EPA PROJECT DESIGNER
LANDON AWADA
PB-1198
EXP: 04/05/2027
STATE OF HAWAII
04/14/2026

LICENSED PROFESSIONAL ENGINEER
KENNETH J. BULL
C 75155
EXP.12-31-26
CIVIL
STATE OF CALIFORNIA
04/14/2026

COMMUNICATION ENGINEER
第3種電気主任技術者
(Type 3 Denki Shunin Gijutsusha)
LC# 44-E934
EXPIRATION DATE : NONE
MASAKI TANABE
SIGNED
04/14/2026

MECHANICAL ENGINEER
建築設備士
(Kenchiku Setsubishi)
No. 29G1 - 1052YU
EXPIRATION DATE : NONE
KAZUKI NAKAMA
SIGNED
04/14/2026

ELECTRICAL ENGINEER
1級電気工事施工管理技士
(1st Class Denkikouji Sekou Kanrigishi)
LC# E056370186
EXPIRATION DATE : NONE
MASAHARU ARAKAWA
SIGNED
04/14/2026

LICENSED ARCHITECT
YOUNG-JAE PARK
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STATE OF ILLINOIS
04/14/2016

**APRIL 2026**

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SECTION 01 11 00.00 10

GENERAL CONTRACT REQUIREMENTS

## PART 1 GENERAL

### 1.1 DEFINITIONS

The term "Government" refers to "United States Government" whenever the term "Government" appears in this Contract, unless otherwise indicated within the Contract.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

| | |
|---|---|
| ASHRAE 189.1 | (2017) Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings |
| ASHRAE 52.2 | (2017) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM D6245 | (2025) Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation |
| ASTM D6345 | (2010) Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 10 | (2022) Standard for Portable Fire Extinguishers |
| NFPA 241 | (2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

| | |
|---|---|
| ANSI/SMACNA 008 | (2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Initial Site Conditions Photos
Key Personnel Qualifications; G
Conformed Drawings Submittal
INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN; G

SD-07 Certificates

Monthly Progress Photos;

SD-11 Closeout Submittals

Construction Completion Photos;

## 1.4 ACCEPTABLE ALTERNATIVE JAPANESE STANDARDS

Where indicated in the technical specifications REFERENCES paragraphs, acceptable Japanese standards are listed which are considered acceptable alternatives to the US Standards within the Contract Specifications. Contract specifications authorize the use of specified acceptable alternative Japanese standards. The use of products not meeting the applicable US standards of the Contract or alternative Japanese standards specifically authorized by the Contract is prohibited unless authorized by the Contracting Officer. Japanese standards not identified in these specifications as being acceptable alternatives to US standards may be submitted to the Contracting Officer for consideration as acceptable alternatives after award using the variation request process set forth in Section 01 33 00 SUBMITTAL PROCEDURES. Prior to the use of such proposed additional alternative Japanese standards, written approval by the Contracting Officer is required. Incorporation of methods, materials, and equipment that will promote cost-effective and timely maintenance, and that are otherwise authorized by the contract, is highly encouraged.

## 1.5 GOVERNMENT FURNISHED CONTRACTOR INSTALLED ITEMS

Attachment 01 11 00.00 10-A "Government Furnished Property" provides the items that shall be Government Furnished, Contractor Installed (GFCI).

### 1.5.1 Requirements for Government Furnished Contractor Installed dishwashers:

a. The contractor will coordinate with Appliance Repair at 632-4099 or 632-4176 for dishwasher delivery. Lead time for delivery is 2 weeks minimum. Delivery of all dishwasher units at one time will require up to 30 days.

b. Contractor shall provide appropriate temporary storage within the

laydown area to accommodate the government furnished dishwasher delivery. Inventory and inspection with photographs of existing conditions and sign off by both receiving and delivery is required.

c. The dishwashers will be delivered unwrapped & barcoded.

d. Contractor shall perform operation check by running a full "normal" cycle. If operation check does not pass, contact Appliance Repair 632-4099 or 632-4176 and notify USACE project engineer and quality assurance representative.

e. Nonoperational dishwashers shall be transferred to temporary storage for pickup by Appliance Repair. Warranty for the dishwasher will not be part of the contract.

## 1.6 MANDATORY U.S. TESTED PRODUCTS

The following items shall meet U.S. testing methods (e.g. UL listed, FM approved, ASTM, etc.) and shall be labeled as required. These items shall not be substituted with Japanese testing methods (e.g. JIS, JASS, etc.) for certification:

a. Fire suppression systems, including valves, alarm valves, sprinklers (pipes and fittings meeting Japanese standards may meet the function requirements). Fire suppression systems includes wet chemical, dry chemical, mist, deluge, pre-action, foam, and clean agent, in addition to standard sprinkler systems.

b. Fire pumps, including motors, controllers, drives, and valves.

c. Fire alarm and mass notification systems, including panels, initiating devices, notification appliances, smoke alarms (conductors and conduits meeting Japanese standards may meet the functional requirements).

d. Engineering technician requirements for development of fire suppression systems and alarm system shop drawings, calculations, and material submittals.

e. Fire doors, smoke doors, and frames.

f. Fire dampers and smoke dampers.

g. Interior finishes with flame spread and smoke development ratings required for installation of rated assemblies.

h. Insulation with flame spread and smoke development ratings.

i. Fire proofing and fire stopping materials.

j. Plenum rated cables.

k. Domestic water supply piping in the building and plumbing fixtures that directly dispense potable drinking water (NSF stamped and/or labeled). Plumbing fixtures meeting Japanese standards that do not directly dispense potable drinking water are allowed, such as urinals and water closets.

## 1.7 KEY PERSONNEL QUALIFICATIONS

The Contractor's Project Key personnel shall not be assigned duties to any other Contracts without approval from the Contracting Officer. The Project Superintendent, CQC System Manager, and Site Safety Health Officer shall all be separate persons, and shall not have other duties assigned. Within five (5) working days after receipt of the Notice to Proceed, the Contractor shall submit in writing to the Contracting Officer an organizational chart, the qualifications and background history of the proposed Key Personnel for approval. The Contracting Officer shall have the explicit right to determine acceptability (or rejection) of the proposed individuals. In addition, the Contractor shall be responsible to replace said individuals upon notification by the Government should performance become inadequate during the Contract period. Key Personnel shall attend the Preconstruction conference.

### 1.7.1 Project Manager

The Project Manager shall have a minimum of five (5) years experience as a Project Manager on construction projects containing architecture, electrical, or mechanical components similar in size and scope to this Contract and have PE or equivalent registration certification. The Project Manager shall maintain oversight of Contract proposals prepared by the Contractor staff and be authorized to negotiate Contract terms and sign Contract documents on behalf of the Contractor. The project manager does not need to be present on the site daily, but shall attend weekly progress meetings and be available on site within 24 hours upon request. Project Manager may have other duties assigned.

### 1.7.2 Project Superintendent (Supervisor)

The Project Superintendent shall be on the work site when on-site work is being performed and shall be available to the Contracting Officer or his representatives upon request. The Project Superintendent shall have overall responsibility for all operations at the job site and be authorized to make decisions, negotiate Contract terms and sign Contract documents on behalf of the Contractor. The Project Superintendent shall have a minimum of five (5) years experience as a superintendent on construction projects containing architecture, electrical, or mechanical components similar in size and scope to this Contract, and have at least one the following qualifications:

a. U.S. Registered Architect or 1 Kyu Kenchikushi (1st Class Qualified Architect).

b. U.S. Registered Civil Engineer or 1 Kyu Doboku Sekou Kanrigishi (1st Class Civil Engineering Works Management Engineer).

c. U.S. Registered Mechanical or Electrical Engineer or 1 Kyu Kankouji Sekou Kanrigishi (1st Class Building Mechanical and Electrical Engineer).

d. U.S. Registered Electrical Engineer or 1 Kyu Denkikouji Sekou Kanrigishi (1st Class Electric Construction Management Engineer).

### 1.7.3 English Speaking Representative (Interpreter)

At all times during the Contract period the Contractor shall have an employee capable of fluent bilingual speech in the Japanese and English

languages at the job site. The bilingual interpreter shall have the capability to receive and issue concise and technical explanation and instructions between the Government representative(s) and Contractor supervisory personnel concerning all aspects of Contract administration and construction. Within fifteen (15) days after receipt of the Notice to Proceed, the Contractor shall submit in writing to the Contracting Officer's Representative the qualifications and background history of the proposed interpreter for approval. The Contracting Officer's Representative shall have the explicit right to determine acceptability or rejection of the proposed individual. In addition, the Contractor shall be responsible to replace said individual upon notification by the Government should performance become inadequate during the Contract period. The interpreter shall attend the preconstruction conference.

1.7.4 Contractor Quality Control

1.7.4.1 Contractor Quality Control System Manager (CQCSM)

The CQC System Manager is required to be a graduate of an accredited college with an engineering, architecture, or construction management degree, with PE or equivalent professional registration and certification, and a minimum of 5 years construction experience on construction of similar size and scope to this Contract. Refer to Section 01 45 00.00 10 QUALITY CONTROL, Paragraph "CQC System Manager" for additional requirements.

1.7.4.2 Contractor Quality Control Personnel

The following Contractor Quality Control (CQC) Personnel are required: Civil, Mechanical, Electrical, Structural, Architectural, Fire Protection, Submittals, Concrete, Pavements, and Soils, Testing, Adjusting, and Balancing. All other specialties in section 01 45 00.00 10 not identified in this paragraph does not apply to this project.

See Section 01 45 00.00 10 QUALITY CONTROL for qualification requirements for CQC personnel. These individuals or specialized technical companies may be employed by the prime contractor or a subcontractor on this project. These individuals shall have no other duties other than quality control. A single person can cover more than one area provided that the single person is qualified to perform quality control activities in each designated and that workload allows.

1.7.5 Site Safety and Health Officer (SSHO)

See Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS.

1.7.6 TPC SUSTAINABILITY PROFESSIONAL

See Section 01 33 29 SUSTAINABILITY REPORTING.

1.8 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

a. This paragraph specifies the procedure for determination of time extensions for unusually severe weather in accordance with the Contract clause entitled "DEFAULT (FIXED-PRICE CONSTRUCTION)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the Contract

period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

b. The listing below defines the monthly anticipated adverse weather days for the Contract period and is based upon 20th Weather Squadron (MAC), U.S. Air Force; Iwakuni U.S. Marine Corps Air Station, Weather Service; Sasebo Naval Pacific Meteorology and Oceanography Detachment; JASDF (Japan Air Self Defense Force), or similar data for the geographic location of the project. (More specific information may be obtained as specified under Special Contract Requirements Clause entitled "Physical Data.")

MONTHLY ANTICIPATED ADVERSE WEATHER DELAYS
WORK DAYS BASED ON (5) DAY WORK WEEK

| | Misawa-area | Kanto Plain | Iwakuni | Okinawa | Sasebo | Osaka |
|---|---|---|---|---|---|---|
| JAN | 8 | 1 | 2 | 5 | 7 | 4 |
| FEB | 9 | 3 | 4 | 7 | 6 | 4 |
| MAR | 6 | 6 | 7 | 8 | 7 | 5 |
| APR | 3 | 6 | 6 | 6 | 7 | 4 |
| MAY | 4 | 4 | 6 | 6 | 6 | 4 |
| JUN | 5 | 9 | 8 | 6 | 12 | 5 |
| JUL | 6 | 6 | 6 | 6 | 9 | 4 |
| AUG | 6 | 6 | 5 | 9 | 9 | 3 |
| SEP | 6 | 7 | 6 | 7 | 9 | 4 |
| OCT | 4 | 5 | 4 | 4 | 8 | 4 |
| NOV | 6 | 4 | 4 | 4 | 5 | 3 |
| DEC | 7 | 1 | 3 | 5 | 5 | 3 |

The above schedule of anticipated adverse weather days shall constitute the base line for monthly (or portion thereof) weather time evaluations.

c. Upon acknowledgment of the Notice-to-Proceed (NTP) and continuing throughout the Contract, the Contractor shall record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day.

d. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph (b), above, the Contracting Officer shall convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the Contract clause entitled "DEFAULT (FIXED PRICE CONSTRUCTION)".

e. For all work under this Contract, adverse weather is defined as:

(1) Rainfall - Number of occurrences of precipitation greater than or

equal to 0.10 inches (2.54mm).

(2) Snowfall - Number of occurrences of precipitation greater than or equal to 1.00 inches (25.4mm). (Not applicable to Okinawa Area)

(3) Cold Temperature - Number of occurrences when daily maximum temperature does not exceed the monthly mean low temperature or 32 degrees Fahrenheit (0 degrees Celsius), whichever is lower. (Not applicable to Okinawa Area)

(4) Concurrence between snowfall and cold temperature is 80 percent, i.e. 80 percent of the time snow falls, the temperature is "cold".

(5) Wind - Number of occurrences when the wind is gusting 30 knots (56 kilometers/hour) or greater.

f. The Contractor's schedule must reflect the above anticipated adverse weather delays on all weather-dependent activities.

## 1.9 PERMITS AND RESPONSIBILITIES

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any laws, codes, and regulations (including the requirements of material, prefectural, and local Government of Japan, and associated military installation) applicable to the performance of work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. These damages shall be repaired or replaced by the Contractor at no cost to the Government. The Contractor shall take proper safety and health precautions to protect all work and workers.

Submit a schedule of planned road closures to the Contracting Officer with the initial project schedule. Notification of specific road closures shall be in writing to the Contracting Officer not less than thirty (30) calendar days in advance of the intended closure. The road closure request shall include the planned traffic control measures as well as the general information about the closure. All road closures shall be coordinated with base officials and are subject to base requirements. No road closure shall be permitted until the Contractor receives written approval from the Contracting Officer. Full road closures is generally not permitted (at least one way traffic shall always be provided).

## 1.10 SPECIAL CONTRACT REQUIREMENTS

### 1.10.1 Meetings

a. Post Award Orientation. A post award orientation (often referred to as a Preconstruction Conference) per FAR 42.503 shall be held. The chairperson shall be the Contracting Officer or his/her designee. The chairperson shall be responsible for providing minutes of the meeting.

b. Weekly Progress Meetings. A weekly progress meeting shall be conducted, with the day, time, and location to be determined at the Preconstruction Conference. The Contractor's Project Manager, Superintendent, Interpreter, and Quality Control Manager shall attend. Representatives from the Government may include, but are not limited to, Director of Public Works/Facilities Engineering personnel, Project's Resident Office personnel, and Project Manager. The

Contractor shall be prepared to discuss work completed during the previous week, work currently in progress, and work forecasted for the following week, as well as the status of any construction issues and open action items. Provide the meeting agenda for review 24 hours prior to the meeting, take notes during the meeting, and provide electronic copies of the meeting minutes in English within 24 hours of the progress meeting for review.

c. Red Zone Meeting. A Red Zone meeting shall be conducted for Contracts with a value in excess of 55,000,000 JPY or those deemed sufficiently complex by the Contracting Officer to warrant one. The purpose of the Red Zone meeting is to discuss closeout requirements for the contract and to establish a timeline to get those items completed (see Section 01 78 00 CLOSEOUT SUBMITTALS for typical closeout requirements). The meeting is a good time for the Contractor to gain approval on format for items such as Operations and Maintenance manuals, the equipment-in-place list, the warranty plan, and any other items. The Initial Red Zone is typically scheduled when project reached 75 percent completion milestone. Provide the meeting agenda for review 24 hours prior to the meeting, take notes during the meeting, and provide electronic copies of the meeting minutes in English within 24 hours of the Red Zone meeting.

d. Safety and Quality Control Meetings. Safety and quality control meetings shall be held as needed and determined by the Contractor. See Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS and Section 01 45 00.00 10 USACE QUALITY CONTROL for specific requirements.

e. Construction Waste Management Meetings. See Section 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT for requirements.

### 1.10.2 Conformed Drawings Submittal

Contractor shall submit one (1) hard copy Japanese-style folded and bound set of conformed A3 size drawings. Submittal shall be provided to the Resident Office at the Pre-Construction meeting. Conformed drawings are defined as the original advertised drawings with amended drawing sheets replaced in-kind with the corresponding original sheet number. If applicable, add new sheets and remove deleted sheets in accordance with amendment instructions. If multiple amendments are issued, supersede any previously amended drawing so that only the highest numbered amendment drawing is included.

### 1.10.3 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

Submit an IAQ Management Plan within 15 days after Notice to Proceed (NTP). The Plan shall include IAQ management practices implemented during construction and preoccupancy phases and describe how each requirement in ANSI/SMACNA 008 will be met, addressed, and managed on the job site. The plan shall cover the following additional items:

a. Identify the key players and person(s) responsible for implementing the plan.

b. Specify procedures for protecting stored and installed absorptive materials from moisture damage.

c. Prohibit the use of tobacco products inside the building and within 7.5 meters (50 feet) of the building entrance at all times during

construction. Consider prohibiting smoking on the entire job site. If smoking will be allowed, locate on a site plan the designated locations and signage. Comply with the tobacco use policy of the local jurisdiction.

d. Indicate whether air handlers will be operated during construction, and specify compliant filtration procedures for permanent equipment that will be used.

e. Take photographs of each IAQ measure for documentation. Annotate photographs to indicate each IAQ measure depicted and its general location. Provide photographs of the methods employed to protect stored and installed absorptive materials from moisture damage during construction and preoccupancy.

Revise and resubmit the Plan as required by the Contracting Officer. Make copies of the final plan available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants.

1.10.3.1 Requirements During Construction

Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with ASTM D6245. Provide for evaluation of volatile organic compounds (VOCs) in indoor air in accordance with ASTM D6345. Use filters with a Minimum Efficiency Reporting Value (MERV) of 8 in permanently installed air handlers during construction.

1.10.3.1.1 Control Measures

Meet or exceed the requirements of ANSI/SMACNA 008, Chapter 3, to help minimize contamination of the building from construction activities. The five requirements of this manual which must be adhered to are described below:

a. HVAC protection: Isolate return side of HVAC system from surrounding environment to prevent construction dust and debris from entering the duct work and spaces.

b. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products must have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.

c. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.

d. Housekeeping: Clean frequently to remove construction dust and debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.

e. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

1.10.3.1.2 Moisture Contamination

a. Remove accumulated water and keep work dry.

b. Use dehumidification to remove moist, humid air from a work area.

c. Do not use combustion heaters or generators inside the building.

d. Protect porous materials from exposure to moisture.

e. Remove and replace items which remain damp for more than a few hours.

1.10.3.2 Requirements after Construction

After construction ends and prior to occupancy, conduct IAQ testing in accordance with ASHRAE 189.1 Section 10.3.1.4.

In the event that IAQ testing fails, conduct a building flush-out in accordance with ASHRAE 189.1 Section 10.3.1.3 and TPC requirements. The space shall be ventilated at a minimum rate of 1.5 Liters per second per square meter of outdoor air while maintaining an internal temperature of at least 15 degrees C (60 degrees F) and no higher than 27 degrees C (80 degrees F) and relative humidity no higher than 60%. Total air volume of outdoor air will be determined by ASHRAE 189.1 Section 10.3.1.4 Equation 10-1. Total volume of outdoor air shall be approved by the Contracting Office prior to building flush-out

Air contamination testing must be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Ambient Air. After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media must have a MERV of 13 as determined by ASHRAE 52.2.

1.10.4 Fire Protection System

The Fire Protection system will be maintained by AF personnel, AF contracted personnel, or AF contracted maintenance. Access to the system will be coordinated two (2) weeks in advance. The KTR shall accommodate the maintenance of the system up to the point of causing a delay to the critical path of the project. If accommodations for access cannot be made at the requested time and date the KTR will provide the next earliest availability so that the request can be made.

1.10.5 Elevator

1. The Elevator system will be maintained by Air Force (AF) personnel, AF contracted personnel, or AF contracted maintenance. Access to the system will be coordinated two (2) weeks in advance. The KTR shall accommodate the maintenance of the system up to the point of causing a delay to the critical path of the project. If accommodations for access cannot be made at the requested time and date the KTR will provide the next earliest availability so that the request can be made.

2. Contractors shall protect the elevators from damage during construction. Contractor shall be responsible for elevator damages caused by the Contractor or their sub-contractors negligence to the elevators during construction.

## 1.11 PROGRESS AND COMPLETION PHOTOGRAPHS

Photographically document site conditions prior to start of construction operations. Provide monthly, and within one month of the completion of work, digital photographs, 1600 by 1200 by 24 bit true color 300 DPI minimum resolution in JPEG file format showing the sequence and progress of work. Take a minimum of 5 digital photographs each week throughout the entire project and 50 digital photographs at completion of project. Submit the Initial Site Conditions Photos, Monthly Progress Photos, and Construction Completion Photos. Indicate photographs demonstrating environmental procedures. Provide photographs for each month in a separate monthly directory and name each file to indicate its location on the view location sketch. Include a date designator in file names. Cross reference submittals in the appropriate daily report. Photographs provided are for unrestricted use by the Government.

## 1.12 BASE REGULATIONS

The Contractor and Subcontractor(s) shall become familiar with and obey all base regulations, including fire, traffic, safety, and security regulations. All Contractors shall keep within the limits of the work (and avenues of ingress and egress), and shall not enter any restricted areas unless required to do so and are cleared for such entry. The Contractor's equipment shall be conspicuously marked for identification.

### 1.12.1 Request for Contractor's Employee Passes and Vehicle Passes

No employee or representative of the Contractor shall be admitted to the work site without a Contracting Officer's furnished authorized admittance. Prior to the start of on-site work, submit applications for base passes to the Contracting Officer for key employees (project manager, site supervisor, interpreter, etc.) for long term DBIDS passes. The Contractor, with assistance from the Resident Office, is responsible for securing sufficient passes for other workers, including subcontractor's employees and vehicles, required to access the base for the project duration. Additional personnel data shall also be furnished.

Provide all information required for background checks to meet base access requirements to be accomplished by Base Provost Marshal Office, Director of Emergency Services or Security Office. Contractor workforce must comply with all personal identity verification requirements as directed by DOD, HQDA and/or local policy. The Government reserves the right to make changes to the Contractor security requirements or processes due to a change in the Force Protection Condition (FPCON).

Upon completion of this Contract, return all employee and vehicle passes to the base, and obtain a certification of receipt. Final payment shall be withheld until all passes have been returned.

### 1.12.2 No Smoking Policy

Smoking is prohibited on installations except in designated smoking areas. This applies to existing buildings, buildings under construction, and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer shall identify designated smoking areas.

### 1.12.3 Unexploded Ordnance (UXO) Procedures on Kadena Air Base

Kadena Air Base 718 CES/CEN assesses the area as UXO unlikely with a low probability of uncovering UXO's on the site. However, since there is always a possibility of encountering UXOs anywhere on Okinawa, albeit unlikely at this location, excavations and other construction activities related earth work on the project site, require a measure of caution. The Ground Penetrating Radar (GPR) survey specified in 01 35 26 paragraph "Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces" for the identification of underground utilities will identify anomalies. Best practices of conducting GPR surveys are to repeat them in areas greater than the used method's level of detection (LOD), down to a depth of 2 meters, to ensure no utility lines or other suspicious objects are present. If suspected UXOs are identified, the construction team needs to follow the standard UXO notification procedures per the Kadena policies identified in attachment 01 11 00.00 10-B "UXO Emergency Mitigation Steps and Survey Policies." The contact number for the Emergency Dispatch Center for Kadena Air Base is 098-934-5911. See the following website for additional information: www.kadena.af.mil/About-Us/Emergency-Actions/.

## 1.13 ORDER OF WORK

### 1.13.1 Schedule

Schedule all work to cause the least amount of interference with activity operations. Permission to interrupt any activity or roads shall be requested in writing a minimum of 30 calendar days prior to the desired date of interruption. Interruptions of activities, roads, and utility services shall be allowed only when they will not cause interference with the operations of the activity. The Contractor shall remove and dispose off Government property all Contractor generated debris at the end of each shift, or more frequently if required, to keep the space usable. Upon award of this Contract, the Contractor shall begin and complete all required work; ready for use and including cleanup, within the time period specified on this Contract. All work scheduled in occupied areas shall be accomplished in such a manner as to cause the least possible inconvenience to the occupants.

### 1.13.2 Working Hours

Normal Working Hours and Days are Monday through Friday, 0800 hours through 1700 hours. Saturday work is allowed on this contract and does not require additional approvals. Notify the Contracting Officer at least three days in advance when scheduling Saturday work.

### 1.13.3 Noise and Vibration

Noise greater than 70 decibels and vibration producing work in occupied buildings shall be conducted outside core school/business hours (0700 - 1430) unless written permission is given by the Contracting Officer.

### 1.13.4 Work Outside of Regular Hours

If the Contractor desires to carry on work outside the regular hours, on Sundays, or holidays, a written application shall be submitted to the Contracting Officer or his representative for approval. The Contractor shall allow three working days notice to enable satisfactory arrangements to be made by the Government for inspecting the work in progress. If work

is to be accomplished after daylight hours, the Contractor shall illuminate the area in a manner approved by the Contracting Officer or their representative and in accordance with EM 385-1-1. Unless directed by a Contracting Officer, work accomplished outside regular working hours shall be at no additional cost to the Government.

## 1.14 FIRE PREVENTION DURING CONSTRUCTION

### 1.14.1 General

Comply with all pertinent fire prevention provisions of the US Army Corps of Engineers Manual EM 385-1-1, NFPA 241 and shall follow the Installation fire regulations. Prior to commencement of welding or other hot work operations, obtain approval from the Installation Fire Chief.

### 1.14.2 Supply

No more than one day's supply of paint, paint materials, or compounds shall be allowed within the area of the building, and shall be removed from the job site after each working day. No gasoline or similar low flash point flammable liquid shall be allowed within the building area. After proper coordination with the Facility's Emergency Services (to confirm the maximum allowable quantities and location of storage), storage of additional product may be authorized.

### 1.14.3 Fire Extinguishers

Provide, as a minimum, the number, size, and type of fire extinguishers in accordance with the latest NFPA 10. The Contractor shall comply with the Installation Fire Chief's policies if they are more stringent than NFPA 10. Fire extinguishers shall remain the property of the Contractor and shall be removed upon completion of the project.

### 1.14.4 Housekeeping

Accumulations of combustible material shall be removed from the building area on a daily basis.

### 1.14.5 Handling of Gasoline

Gasoline shall be stored in industry standard approved safety containers. Adequate ventilation shall be provided to safely dispose of flammable vapors where flammable liquids are utilized. Gasoline powered equipment shall be refueled a minimum 6 meters away from the building area.

### 1.14.6 Notification of Fire

Be familiar with methods for notifying the Installation Fire Department. The Installation's fire poster shall be posted in conspicuous locations and at telephones in construction shacks.

## 1.15 CONTRACTOR FURNISHED MATERIAL AND WORKMANSHIP

The Contractor shall furnish all materials necessary for performance of the work of this contract unless otherwise specified. Materials procured shall be new and shall meet any specifications and standards listed in these specifications. If no specification for a material needed to perform this contract are stated, the material shall be new, of acceptable industrial grade and quality, equal to or better than the manufacturer's

original equipment for equipment being repaired or replaced, and will be compatible with existing materials and systems. All materials provided under this contract shall be free of asbestos, lead in paint, and PCB. The Contracting Officer reserves the right to request submittal of any material being provided under this contract. The Contracting Officer shall make the final determination of the acceptability of any material used on this contract.

## 1.16 CORRESPONDENCE

All correspondence addressed to the Government shall be made through serialized letters furnished with one original and two copies. Serialized letters shall begin with the number S-0001 and shall be continuous without a break in numbering. Serialized letters shall include the contract title and number, date, subject, and shall be signed by an authorized representative of the Contractor.

# PART 2 PRODUCTS (NOT USED)

# PART 3 EXECUTION (NOT USED)

-- End of Section --

# Government Furnished Property

Reset Form

Validate

Attachment Number

Attachment File

of

Attachment Date

## Government Contracting Officer

Name

Email

Phone

Contract Award

Contract Modification

OR

Solicitation

Amendment

Modification Number

Amendment Number

Reference Procurement Instrument Number

## Custodial Procurement Instrument Identification

Solicitation, Contract or Uniform PIID Number

| Issuing Office DoDAAC | Issue Year (YY) | Contract Type | Sequence Number |
|---|---|---|---|
| | | | |

OR

Order Number (PIID Format FY16+)

| Issuing Office DoDAAC | Issue Year (YY) | Contract Type | Sequence Number |
|---|---|---|---|
| | | | |

Old Order Format

Consolidated GFP Attachment V.M.1.1

# Government Furnished Property

ADD

SERIALLY MANAGED ITEMS LIST

| Line Number | Item Name | Item Description | NSN | CAGE | Part Number | Model Number | Serial Number | UII | QTY | Unit of Measure | Unit Cost | Use As Is |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |

Remove

| Delivery Date (On or Before) | Duration | Time Unit | Delivery Event | Notes |
|---|---|---|---|---|
| | | | | |

ADD

NON-SERIALLY MANAGED ITEMS LIST

| Line Number | Item Name | Item Description | NSN | CAGE | Part Number | Model Number | QTY | Unit of Measure | Unit Cost | Use As Is |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |

Remove

| Delivery Date (On or Before) | Duration | Time Unit | Delivery Event | Notes |
|---|---|---|---|---|
| | | | | |

Items Authorized to be Requisitioned by the Contractor and Paid for by DoD

ADD

| Line Number | Item Name | Item Description | NSN | CAGE | Part Number | QTY | Unit of Measure | Unit Cost | Use As Is |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

Remove

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# SECTION 01 20 00

# PRICE AND PAYMENT PROCEDURES

## PART 1 GENERAL

### 1.1 GENERAL

Payment items for the work of this Contract for which payments shall be made are listed in the CONTRACT LINE ITEM NUMBER (CLIN) SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular job or unit price payment item, are included in the listed job item most closely associated with the work involved. The price and payment made for each item listed constitutes full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, topographic surveys, cost of bond premiums, and for performing all work required by drawings and specifications for which separate payment is not otherwise provided. Work paid for under one item shall not be paid for under any other item. No separate payment shall be made for the work, services, or operations required by the Contractor, as specified in DIVISION 01, GENERAL REQUIREMENTS, to complete the project in accordance with these specifications; all costs thereof shall be considered as incidental to the work.

### 1.2 Submittals

Government approval is required for submittals with a "G" designation; DESIGN-BID-BUILD:submittals not haveing a "G" designation are for information only; Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Bill Of Lading; G

### 1.3 LINE ITEMS

#### 1.3.1 CLIN 0001, Tower 4511 Repair and Renovation Work on Camp Courtney.

##### 1.3.1.1 Payment

Payment shall be made at the Contract job price for CLIN 0001 "Tower 4511 repair and renovation work on Camp Courtney" for work completed including, but not limited to replacement of roof tiles, roof surface waterproofing, replace aluminum windows, replace doors, paint interior walls, ceiling and doors, provide vinyl flooring and wall base in community room, new HVAC system, new plumbing system including water, sanitary, vent and drain piping, remove existing indoor transformers and replace with new outdoor transformers, new electrical wiring for new HVAC and water heater system, replace deteriorated sprinklers located under driveway, exterior balcony, etc, relocate knox box, replace all smoke/CO detectors, provide LED exit signs, replace existing fire alarm strobe with new, provide local operating console (LOC)for emergency, cybersecurity, and commissioning. Payment for work completed shall constitute full compensation of CLIN

0001, complete.

1.3.1.2 Unit of Measure

Unit of measure: job.

1.3.2 CLIN 0002, Construction of Supporting Infrastructure beyond 1.5 meters of Tower 4511

1.3.2.1 Payment

Payment shall be made at the Contract job price for CLIN 0002 "Construction of Supporting Infrastructure beyond 1.5 meters of Tower 4511" for work completed including, but not limited to, construction of Supporting Facilities including replacement of existing downspout connnections, exterior condensate drain piping, exterior sanitary sewer building connections to nearest manhole, catch basin or lateral line, domestic water supply line connection to nearest gate valve, and related surface restoration of AC pavement, curbs and gutters, sidewalks, sodding and gravel groundcover and pavement markings as shown on the drawings and specifications 1.5 meter outside of buildings, complete. Payment for work completed shall constitute full compensation of CLIN 0002, complete.

1.3.2.2 Unit of Measure

Unit of measure: job.

1.3.3 CLIN 0003, Asbestos Remediation

1.3.3.1 Payment

Payment shall be made at the Contract job price for CLIN 0003 "Asbestos Remediation" as shown on the drawings and specifications, complete. Payment for work completed shall constitute full compensation of CLIN 0003, complete.

1.3.3.2 Unit of Measure

Unit of measure: job.

1.3.4 CLIN 0004, Lead Based Paint Remediation

1.3.4.1 Payment

Payment shall be made at the Contract job price for CLIN 0004 "Lead Based Paint Remediation" as shown on the drawings and specifications, complete. Payment for work completed shall constitute full compensation of CLIN 0004, complete.

1.3.4.2 Unit of Measure

Unit of measure: job.

1.3.5 CLIN 0005, Mold Remediation

1.3.5.1 Payment

Payment shall be made at the Contract job price for CLIN 0005 "Mold Remediation" as shown on the drawings and specifications, complete.

Payment for work completed shall constitute full compensation of CLIN 0005, complete.

1.3.5.2 Unit of Measure

Unit of measure: job.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PROGRESS PAYMENT INVOICE

Requests for payment shall be submitted in accordance with Federal Acquisition Regulations (FAR) Subpart 32.9, entitled "PROMPT PAYMENT", and Paragraphs 52.232-5 and 52.232-27, entitled "Payments Under Fixed-Price Construction Contracts", and "Prompt Payment for Construction Contracts", respectively. In addition each request shall be submitted in the number of copies and to the designated billing office as shown in the Contract.

When submitting payment requests, the Contractor shall complete Blocks 1 through 12 of the "PROGRESS PAYMENT INVOICE" Form as directed by the Contracting Officer (provided in RMS CM). The completed form shall then become the cover document to which all other support data shall be attached.

One additional copy of the entire request for payment, to include the "PROGRESS PAYMENT INVOICE" cover document, shall be forwarded to a separate address as designated by the Contracting Officer.

The Contractor shall submit with each pay request, a list of subcontractors that have worked during that pay period. The listing shall be broken down into weeks, identifying each subcontractor that has worked during a particular week, and indicate the total number of employees that have worked on site for each subcontractor for each week. The prime Contractor shall also indicate the total number of employees for its on site staff for each week.

Formal invoices shall be submitted every month between the first and the tenth of the month. Any invoice received after the tenth will be considered as not meeting the contract requirements and rejected. It may be resubmitted on the first of the following month.

3.2 TRANSPORTATION OF SUPPLIES BY SEA, BILL OF LADING

The Contractor shall, within 30 days after each shipment covered by Defense Federal Acquisition Regulation (DFAR) Subpart 252.247-7023, provide the Contracting Officer and the Maritime Administration (MARAD) one copy of the rated on board vessel operating carrier's ocean Bill of Lading. See DFAR 252.247-7023 for information required in the bill of lading. MARAD contact information: usarmy.scott.sddc.mbx.g3-ffw-team@mail.mil and msc.n101.ffw@navy.mil.

The Contractor shall use U.S.-flag vessels when transporting any supplies by sea under this contract. If U.S.-flag vessels are not available, the Contractor may submit a request for use of foreign-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. Refer to DFAR 252.247-7023 for required documentation when making this request. The Contracting Officer

will process requests submitted as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay. Failure to get approval prior to the use of foreign-flag vessels may result in monetary penalty.

## 3.3 CONTRACT COST BREAKDOWN

The Contractor must furnish within 30 days after the date of Notice to Proceed, and prior to the submission of its first partial payment estimate, a breakdown of its single job pay item or items which will be reviewed by the Contracting Officer as to propriety of distribution of the total cost to the various accounts. Any unbalanced items as between early and late payment items or other discrepancies will be revised by the Contracting Officer to agree with a reasonable cost of the work included in the various items. This contract cost breakdown will then be utilized as the basis for progress payments to the Contractor.

## 3.4 CONTRACT ADMINISTRATION

### 3.4.1 Contracting Officer (KO)

This Contract shall be administered by a Contracting Officer (KO) assigned to the U.S. Army Corps of Engineers, Japan Engineer District, APO AP 96338-5010.

### 3.4.2 Administrative Contracting Officer (ACO)

In accordance with the USACE Acquisition Instruction (UAI) 5101.603-3-100, Appointment, Administrative Contracting Officer(s) (ACO's) may be delegated a part of the Contracting Officer's authority to modify this Contract and perform Contract administration functions under Federal Acquisition Regulation (FAR) Section 42.302, subject to the authority and limitations set forth in the appointment and delegation letter.

### 3.4.3 Contracting Officer's Representative (COR)

The Contracting Officer may designate one or more individuals as his/her authorized representatives in administering this Contract. Refer to the clause in Section 00 70 00 CONDITIONS OF THE CONTRACT entitled CONTRACTING OFFICER'S REPRESENTATIVE (DFARS 252.201-7000) for the definition and limited authority of CORs.

## 3.5 DESIGNATED BILLING OFFICE

The designated billing office for this Contract is:

Resident Engineer, Zukeran Resident Office
U.S. Army Corps of Engineers, Japan Engineer District
Unit 35132
APO AP 96376-5132

-- End of Section --

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**02/15**

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PROJECT SCHEDULE
**02/15**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AACE INTERNATIONAL (AACE)

| | |
|---|---|
| AACE 29R-03 | (2011) Forensic Schedule Analysis |
| AACE 52R-06 | (2006) Time Impact Analysis - As Applied in Construction |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| ER 1-1-11 | (1995) Administration -- Progress, Schedules, and Network Analysis Systems |

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Project Scheduler Qualifications; G

Preliminary Project Schedule; G

Initial Project Schedule; G

Periodic Schedule Update; G

1.3 PROJECT SCHEDULER QUALIFICATIONS

Designate an authorized representative to be responsible for the preparation of the schedule and all required updating and production of reports. The Designated Project Scheduler must have a minimum of 5-years experience scheduling construction projects similar in size and nature to this project and be proficient in P6 software. Scheduler cannot have other duties on the project. Representative must have a comprehensive knowledge of CPM scheduling principles and application.

PART 2 PRODUCTS

2.1 SOFTWARE

The scheduling software utilized to produce and update the schedules

required herein must be capable of meeting all requirements of this specification.

### 2.1.1 Government Default Software

The Government intends to use Primavera P6.

### 2.1.2 Contractor Software

Scheduling software used by the contractor must be commercially available from the software vendor for purchase with vendor software support agreements available. The software routine used to create the required sdef file must be created and supported by the software manufacturer.

#### 2.1.2.1 Primavera

If Primavera P6 is selected for use, provide the "xer" export file in a version of P6 importable by the Government system.

#### 2.1.2.2 Other Than Primavera

If the contractor chooses software other than Primavera P6, that is compliant with this specification, provide for the Government's use two licenses, two computers, and training for two Government employees in the use of the software. These computers will be stand-alone and not connected to Government network. Computers and licenses will be returned at project completion.

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein, pursuant to FAR Clause 52.236-15 Schedules for Construction Contracts. Show in the schedule the proposed sequence to perform the work and dates contemplated for starting and completing all schedule activities. The scheduling of the entire project is required. The scheduling of construction is the responsibility of the Contractor. Contractor management personnel must actively participate in its development. Subcontractors and suppliers working on the project must also contribute in developing and maintaining an accurate Project Schedule. Provide a schedule that is a forward planning as well as a project monitoring tool. Use the Critical Path Method (CPM) of network calculation to generate all Project Schedules. Prepare each Project Schedule using the Precedence Diagram Method (PDM).

## 3.2 BASIS FOR PAYMENT AND COST LOADING

The schedule is the basis for determining contract earnings during each update period and therefore the amount of each progress payment. The aggregate value of all activities coded to a contract CLIN must equal the value of the CLIN.

### 3.2.1 Activity Cost Loading

Activity cost loading must be reasonable and without front-end loading. Provide additional documentation to demonstrate reasonableness if requested by the Contracting Officer.

### 3.2.2 Withholdings / Payment Rejection

Failure to meet the requirements of this specification may result in the disapproval of the preliminary, initial or periodic schedule updates and subsequent rejection of payment requests until compliance is met.

In the event that the Contracting Officer directs schedule revisions and those revisions have not been included in subsequent Project Schedule revisions or updates, the Contracting Officer may withhold 10 percent of pay request amount from each payment period until such revisions to the project schedule have been made.

## 3.3 PROJECT SCHEDULE DETAILED REQUIREMENTS

### 3.3.1 Level of Detail Required

Develop the Project Schedule to the appropriate level of detail to address major milestones and to allow for satisfactory project planning and execution. Failure to develop the Project Schedule to an appropriate level of detail will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

### 3.3.2 Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities may have Original Durations (OD) greater than 20 work days or 30 calendar days.

### 3.3.3 Procurement Activities

Include activities associated with the critical submittals and their approvals, procurement, fabrication, and delivery of long lead materials, equipment, fabricated assemblies, and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days.

### 3.3.4 Mandatory Tasks

Include the following activities/tasks in the initial project schedule (as applicable to the project) and all updates.

a. Submission, review and acceptance of SD-01 Preconstruction Submittals (individual activity for each).

b. (When required by the contract) Submission, review and acceptance of features require design completion

c. Submission of mechanical/electrical/information systems layout drawings.

d. Long procurement activities

e. Submission and approval of O & M manuals.

f. Submission and approval of as-built drawings.

g. Submission and approval of DD1354 data and installed equipment lists.

h. Submission and approval of testing and air balance (TAB).

i. Submission of TAB specialist design review report.

j. Submission and approval of fire protection specialist.

k. Submission and approval of Building Commissioning Plan, test data, and reports: Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements. All tasks associated with all building testing and commissioning will be completed prior to submission of building commissioning report and subsequent contract completion.

l. Air and water balancing.

m. Building commissioning - Functional Performance Testing.

n. Controls testing plan submission.

o. Controls testing.

p. Performance Verification testing.

q. Other systems testing, if required.

r. Contractor's pre-final inspection.

s. Correction of punch list from Contractor's pre-final inspection.

t. Government's pre-final inspection.

u. Correction of punch list from Government's pre-final inspection.

v. Final inspection.

w. Planned Utility Outages (electrical, water, gas, etc.).

### 3.3.5 Government Activities

Show Government and other agency activities that could impact progress. These activities include, but are not limited to: approvals, environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

### 3.3.6 Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11. This exact structure is mandatory. Develop and assign all Activity Codes to activities as detailed herein. A template SDEF compatible schedule backup file is available on the QCS web site: http://rms.usace.army.mil.

The SDEF format is as follows:

| Field | Activity Code | Length | Description |
|---|---|---|---|
| 1 | WRKP | 3 | Workers per day |
| 2 | RESP | 4 | Responsible party |
| 3 | AREA | 4 | Area of work |
| 4 | MODF | 6 | Modification Number |
| 5 | BIDI | 6 | Bid Item (CLIN) |
| 6 | PHAS | 2 | Phase of work |
| 7 | CATW | 1 | Category of work |
| 8 | FOW | 20 | Feature of work* |

*Some systems require that FEATURE OF WORK values be placed in several activity code fields. The notation shown is for Primavera P6. Refer to the specific software guidelines with respect to the FEATURE OF WORK field requirements.

3.3.6.1 Workers Per Day (WRKP)

Assign Workers per Day for all field construction or direct work activities, if directed by the Contracting Officer. Workers per day is based on the average number of workers expected each day to perform a task for the duration of that activity.

3.3.6.2 Responsible Party Coding (RESP)

Assign responsibility code for all activities to the Prime Contractor, Subcontractor(s) or Government agency(ies) responsible for performing the activity.

a. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Property/Equipment (GFP) and Notice to Proceed (NTP) for phasing requirements.

b. Activities cannot have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE).

3.3.6.3 Area of Work Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a

building, and different buildings within a complex of buildings. Activities cannot have more than one Work Area Code.

Not all activities are required to be Work Area coded. A lack of Work Area coding indicates the activity is not resource or space constrained.

3.3.6.4 Modification Number (MODF)

Assign a Modification Number Code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer. Key all Code values to the Government's modification numbering system. An activity can have only one Modification Number Code.

3.3.6.5 Bid Item Coding (BIDI)

Assign a Bid Item Code to all activities using the Contract Line Item Schedule (CLIN) to which the activity belongs, even when an activity is not cost loaded. An activity can have only one BIDI Code.

3.3.6.6 Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities. Examples of phase of work are procurement phase and construction phase. Each activity can have only one Phase of Work code.

a. Code proposed fast track design and construction phases proposed to allow filtering and organizing the schedule by fast track design and construction packages.

b. If the contract specifies phasing with separately defined performance periods, identify a Phase Code to allow filtering and organizing the schedule accordingly.

3.3.6.7 Category of Work Coding (CATW)

Assign a Category of Work Code to all activities. Category of Work Codes include, but are not limited to construction submittal, procurement, fabrication, weather sensitive installation, non-weather sensitive installation, start-up, and testing activities. Each activity can have no more than one Category of Work Code.

3.3.6.8 Feature of Work Coding (FOW)

Assign a Feature of Work Code to appropriate activities based on the Definable Feature of Work to which the activity belongs based on the approved QC plan.

Definable Feature of Work is defined in Section 01 45 00.00 10 QUALITY CONTROL. An activity can have only one Feature of Work Code.

3.3.7 Contract Milestones and Constraints

Milestone activities are to be used for significant project events including, but not limited to, project phasing, project start and end activities, or interim completion dates. The use of artificial float constraints such as "zero free float" or "zero total float" are prohibited.

Mandatory constraints that ignore or effect network logic are prohibited. No constrained dates are allowed in the schedule other than those specified herein. Submit additional constraints to the Contracting Officer for approval on a case by case basis.

#### 3.3.7.1 Project Start Date Milestone and Constraint

The first activity in the project schedule must be a start milestone titled "NTP Acknowledged," which must have a "Start On" constraint date equal to the date that the NTP is acknowledged.

#### 3.3.7.2 End Project Finish Milestone and Constraint

The last activity in the schedule must be a finish milestone titled "End Project."

Constrain the project schedule to the Contract Completion Date in such a way that if the schedule calculates an early finish, then the float calculation for "End Project" milestone reflects positive float on the longest path. If the project schedule calculates a late finish, then the "End Project" milestone float calculation reflects negative float on the longest path. The Government is under no obligation to accelerate Government activities to support a Contractor's early completion.

#### 3.3.7.3 Interim Completion Dates and Constraints

Constrain contractually specified interim completion dates to show negative float when the calculated late finish date of the last activity in that phase is later than the specified interim completion date.

##### 3.3.7.3.1 Start Phase

Use a start milestone as the first activity for a project phase. Call the start milestone "Start Phase X" where "X" refers to the phase of work.

##### 3.3.7.3.2 End Phase

Use a finish milestone as the last activity for a project phase. Call the finish milestone "End Phase X" where "X" refers to the phase of work.

### 3.3.8 Calendars

Schedule activities on a Calendar to which the activity logically belongs. Develop calendars to accommodate any contract defined work period such as a 7-day calendar for Government Acceptance activities, concrete cure times, etc. Develop the default Calendar to match the physical work plan with non-work periods identified including weekends and holidays. Develop Seasonal Calendar(s) and assign to seasonally affected activities as applicable.

If an activity is weather sensitive it should be assigned to a calendar showing non-work days on a monthly basis, with the non-work days selected at random across the weeks of the calendar, using the anticipated adverse weather delay work days provided in the paragraph titled TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER in Section 01 11 00.00 10 GENERAL CONTRACT REQUIREMENTS. Assign non-work days over a seven-day week as weather records are compiled on seven-day weeks, which may cause some of the weather related non-work days to fall on weekends.

### 3.3.9 Open Ended Logic

Only two open ended activities are allowed: the first activity "NTP Acknowledged" may have no predecessor logic, and the last activity -"End Project" may have no successor logic.

Predecessor open ended logic may be allowed in a time impact analyses upon the Contracting Officer's approval.

### 3.3.10 Default Progress Data Disallowed

Actual Start and Finish dates must not automatically update with default mechanisms included in the scheduling software. Updating of the percent complete and the remaining duration of any activity must be independent functions. Disable program features that calculate one of these parameters from the other. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process must match those dates provided in the Contractor Quality Control Reports. Failure to document the AS and AF dates in the Daily Quality Control report will result in disapproval of the Contractor's schedule.

### 3.3.11 Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Address out of sequence progress or logic changes in the Narrative Report and in the periodic schedule update meetings.

### 3.3.12 Added and Deleted Activities

Do not delete activities from the project schedule or add new activities to the schedule without approval from the Contracting Officer. Activity ID and description changes are considered new activities and cannot be changed without Contracting Officer approval.

### 3.3.13 Original Durations

Activity Original Durations (OD) must be reasonable to perform the work item. OD changes are prohibited unless justification is provided and approved by the Contracting Officer.

### 3.3.14 Leads, Lags, and Start to Finish Relationships

Lags must be reasonable as determined by the Government and not used in place of realistic original durations, must not be in place to artificially absorb float, or to replace proper schedule logic.

a. Leads (negative lags) are prohibited.

b. Start to Finish (SF) relationships are prohibited.

### 3.3.15 Retained Logic

Schedule calculations must retain the logic between predecessors and successors ("retained logic" mode) even when the successor activity(s) starts and the predecessor activity(s) has not finished (out-of-sequence

progress). Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") are not be allowed.

3.3.16 Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete to allow for proper schedule management.

3.3.17 Remaining Duration

Update the remaining duration for each activity based on the number of estimated work days it will take to complete the activity. Remaining duration may not mathematically correlate with percentage found under paragraph entitled Percent Complete.

3.3.18 Cost Loading of Closeout Activities

Cost load the "Correction of punch list from Government pre-final inspection" activity(ies) not less than 1 percent of the present contract value. Activity(ies) may be declared 100 percent complete upon the Government's verification of completion and correction of all punch list work identified during Government pre-final inspection(s).

3.3.18.1 As-Built Drawings

If there is no separate contract line item (CLIN) for as-built drawings, cost load the "Submission and approval of as-built drawings" activity not less than $35,000 or 1 percent of the present contract value, which ever is greater, up to $200,000. Activity will be declared 100 percent complete upon the Government's approval.

3.3.18.2 O & M Manuals

Cost load the "Submission and approval of O & M manuals" activity not less than $20,000. Activity will be declared 100 percent complete upon the Government's approval of all O & M manuals.

3.3.19 Early Completion Schedule and the Right to Finish Early

An Early Completion Schedule is an Initial Project Schedule (IPS) that indicates all scope of the required contract work will be completed before the contractually required completion date.

a. No IPS indicating an Early Completion will be accepted without being fully resource-loaded (including crew sizes and manhours) and the Government agreeing that the schedule is reasonable and achievable.

b. The Government is under no obligation to accelerate work items it is responsible for to ensure that the early completion is met nor is it responsible to modify incremental funding (if applicable) for the project to meet the contractor's accelerated work.

## 3.4 PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. Include the submittal register with project schedule submissions. The data CD/DVD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS. If the Contractor fails or refuses to furnish the information and schedule updates as set forth herein, then the Contractor will be deemed not to have provided an estimate upon which a progress payment can be made.

Review comments made by the Government on the schedule(s) do not relieve the Contractor from compliance with requirements of the Contract Documents.

### 3.4.1 Preliminary Project Schedule Submission

Within 15 calendar days after the NTP is acknowledged submit the Preliminary Project Schedule defining the planned operations detailed for the first 90 calendar days for approval. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. The Preliminary Project Schedule may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) and other non-construction activities intended to occur within the first 90 calendar days. Government acceptance of the associated design package(s) and all other specified Program and Plan approvals must occur prior to any planned construction activities. Activity code any activities that are summary in nature after the first 90 calendar days with Bid Item (CLIN) code (BIDI), Responsibility Code (RESP) and Feature of Work code (FOW).

### 3.4.2 Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after notice to proceed is issued. The schedule must demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. No payment will be made for work items not fully detailed in the Project Schedule.

### 3.4.3 Periodic Schedule Updates

Update the Project Schedule on a regular basis, monthly at a minimum. Provide a draft Periodic Schedule Update for review at the schedule update meetings as prescribed in the paragraph PERIODIC SCHEDULE UPDATE MEETINGS. These updates will enable the Government to assess Contractor's progress.

a. Update information including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD), and Percent Complete is subject to the approval of the Government at the meeting.

b. AS and AF dates must match the date(s) reported on the Contractor's Quality Control Report for an activity start or finish.

## 3.5 SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

### 3.5.1 Data in Electronic Format

Provide two sets of data in electronic format containing the current project schedule and all previously submitted schedules in the format of the scheduling software (e.g. .xer). Also include the Narrative Report and all required Schedule Reports. Label each electronic submission indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file name. Each schedule must have a unique file name and use project specific settings.

### 3.5.2 Narrative Report

Provide a Narrative Report with each schedule submission. The Narrative Report is expected to communicate to the Government the thorough analysis of the schedule output and the plans to compensate for any problems, either current or potential, which are revealed through that analysis. Include the following information as minimum in the Narrative Report:

a. Identify and discuss the work scheduled to start in the next update period.

b. A description of activities along the two most critical paths where the total float is less than or equal to 20 work days.

c. A description of current and anticipated problem areas or delaying factors and their impact and an explanation of corrective actions taken or required to be taken.

d. Identify and explain why activities based on their calculated late dates should have either started or finished during the update period but did not.

e. Identify and discuss all schedule changes by activity ID and activity name including what specifically was changed and why the change was needed. Include at a minimum new and deleted activities, logic changes, duration changes, calendar changes, lag changes, resource changes, and actual start and finish date changes.

f. Identify and discuss out-of-sequence work.

### 3.5.3 Schedule Reports

The format, filtering, organizing and sorting for each schedule report will be as directed by the Contracting Officer. Typically, reports contain Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. Provide the reports electronically in .pdf format. The following lists typical reports that will be requested:

#### 3.5.3.1 Activity Report

List of all activities sorted according to activity number.

3.5.3.2 Logic Report

List of detailed predecessor and successor activities for every activity in ascending order by activity number.

3.5.3.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

3.5.3.4 Earnings Report by CLIN

A compilation of the Total Earnings on the project from the NTP to the data date, which reflects the earnings of activities based on the agreements made in the schedule update meeting defined herein. Provided a complete schedule update has been furnished, this report serves as the basis of determining progress payments. Group activities by CLIN number and sort by activity number. Provide a total CLIN percent earned value, CLIN percent complete, and project percent complete. The printed report must contain the following for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Earnings to Date, Earnings this period, Total Quantity, Quantity to Date, and Percent Complete (based on cost).

3.5.3.5 Schedule Log

Provide a Scheduling/Leveling Report generated from the current project schedule being submitted.

3.5.4 Network Diagram

The Network Diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.4.1 Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.5.4.2 Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.4.3 Critical Path

Show all activities on the critical path. The critical path is defined as the longest path.

3.5.4.4 Banding

Organize activities using the WBS or as otherwise directed to assist in the understanding of the activity sequence. Typically, this flow will

group activities by major elements of work, category of work, work area and/or responsibility.

#### 3.5.4.5 Cash Flow / Schedule Variance Control (SVC) Diagram

With each schedule submission, provide a SVC diagram showing 1) Cash Flow S-Curves indicating planned project cost based on projected early and late activity finish dates, and 2) Earned Value to-date.

## 3.6 PERIODIC SCHEDULE UPDATE

### 3.6.1 Periodic Schedule Update Meetings

Conduct periodic schedule update meetings for the purpose of reviewing the proposed Periodic Schedule Update, Narrative Report, Schedule Reports, and progress payment. Conduct meetings at least monthly within five days of the proposed schedule data date. Provide a computer with the scheduling software loaded and a projector which allows all meeting participants to view the proposed schedule during the meeting. The Contractor's authorized scheduler must organize, group, sort, filter, perform schedule revisions as needed and review functions as requested by the Contractor and/or Government. The meeting is a working interactive exchange which allows the Government and Contractor the opportunity to review the updated schedule on a real time and interactive basis. The meeting will last no longer than 8 hours. Provide a draft of the proposed narrative report and schedule data file to the Government a minimum of two workdays in advance of the meeting. The Contractor's Project Manager and scheduler must attend the meeting with the authorized representative of the Contracting Officer. Superintendents, foremen and major subcontractors must attend the meeting as required to discuss the project schedule and work. Following the periodic schedule update meeting, make corrections to the draft submission. Include only those changes approved by the Government in the submission and invoice for payment.

### 3.6.2 Update Submission Following Progress Meeting

Submit the complete Periodic Schedule Update of the Project Schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 work days after the periodic schedule update meeting.

## 3.7 WEEKLY PROGRESS MEETINGS

Conduct a weekly meeting with the Government (or as otherwise mutually agreed to) between the meetings described in paragraph entitled PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. Use the current approved schedule update for the purposes of this meeting and for the production and review of reports. At the weekly progress meeting, address the status of RFIs, RFPs and Submittals.

## 3.8 REQUESTS FOR TIME EXTENSIONS

Provide a justification of delay to the Contracting Officer in accordance with the contract provisions and clauses for approval within 10 days of a delay occurring. Also prepare a time impact analysis for each Government request for proposal (RFP) to justify time extensions.

### 3.8.1 Justification of Delay

Provide a description of the event(s) that caused the delay and/or impact to the work. As part of the description, identify all schedule activities impacted. Show that the event that caused the delay/impact was the responsibility of the Government. Provide a time impact analysis that demonstrates the effects of the delay or impact on the project completion date or interim completion date(s). Evaluate multiple impacts chronologically; each with its own justification of delay. With multiple impacts consider any concurrency of delay. A time extension and the schedule fragnet becomes part of the project schedule and all future schedule updates upon approval by the Contracting Officer.

### 3.8.2 Time Impact Analysis (Prospective Analysis)

Prepare a time impact analysis for approval by the Contracting Officer based on industry standard AACE 52R-06. Utilize a copy of the last approved schedule prior to the first day of the impact or delay for the time impact analysis. If the Contracting Officer determines the time frame between the last approved schedule and the first day of impact is too great, prepare an interim updated schedule to perform the time impact analysis. Unless approved by the Contracting Officer, no other changes may be incorporated into the schedule being used to justify the time impact.

### 3.8.3 Forensic Schedule Analysis (Retrospective Analysis)

Prepare an analysis for approval by the Contracting Officer based on industry standard AACE 29R-03.

### 3.8.4 Fragmentary Network (Fragnet)

Prepare a proposed fragnet for time impact analysis consisting of a sequence of new activities that are proposed to be added to the project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. Clearly show how the proposed fragnet is to be tied into the project schedule including all predecessors and successors to the fragnet activities. The proposed fragnet must be approved by the Contracting Officer prior to incorporation into the project schedule.

### 3.8.5 Time Extension

The Contracting Officer must approve the Justification of Delay including the time impact analysis before a time extension will be granted. No time extension will be granted unless the delay consumes all available Project Float and extends the projected finish date ("End Project" milestone) beyond the Contract Completion Date. The time extension will be in calendar days.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

### 3.8.6 Impact to Early Completion Schedule

No extended overhead will be paid for delay prior to the original Contract Completion Date for an Early Completion IPS unless the Contractor actually

performed work in accordance with that Early Completion Schedule. The Contractor must show that an early completion was achievable had it not been for the impact.

## 3.9 FAILURE TO ACHIEVE PROGRESS

Should the progress fall behind the approved project schedule for reasons other than those that are excusable within the terms of the contract, the Contracting Officer may require provision of a written recovery plan for approval. The plan must detail how progress will be made-up to include which activities will be accelerated by adding additional crews, longer work hours, extra work days, etc.

### 3.9.1 Artificially Improving Progress

Artificially improving progress by means such as, but not limited to, revising the schedule logic, modifying or adding constraints, shortening activity durations, or changing calendars in the project schedule is prohibited. Indicate assumptions made and the basis for any logic, constraint, duration and calendar changes used in the creation of the recovery plan. Any additional resources, manpower, or daily and weekly work hour changes proposed in the recovery plan must be evident at the work site and documented in the daily report along with the Schedule Narrative Report.

### 3.9.2 Failure to Perform

Failure to perform work and maintain progress in accordance with the supplemental recovery plan may result in an interim and final unsatisfactory performance rating and may result in corrective action directed by the Contracting Officer pursuant to FAR 52.236-15 Schedules for Construction Contracts, FAR 52.249-10 Default (Fixed-Price Construction), and other contract provisions.

### 3.9.3 Recovery Schedule

Should the Contracting Officer find it necessary, submit a recovery schedule pursuant to FAR 52.236-15 Schedules for Construction Contracts.

## 3.10 OWNERSHIP OF FLOAT

Except for the provision given in the paragraph IMPACT TO EARLY COMPLETION SCHEDULE, float available in the schedule, at any time, may not be considered for the exclusive use of either the Government or the Contractor including activity and/or project float. Activity float is the number of work days that an activity can be delayed without causing a delay to the "End Project" finish milestone. Project float (if applicable) is the number of work days between the projected early finish and the contract completion date milestone.

## 3.11 TRANSFER OF SCHEDULE DATA INTO RMS CM

Import the schedule data into the Resident Management System Contractor Mode (RMS CM). This data is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and matching application for

progress payment in RMS CM.

## 3.12 PRIMAVERA P6 MANDATORY REQUIREMENTS

If Primavera P6 is being used, request a backup file template (.xer) from the Government, if one is available, prior to building the schedule. The following settings are mandatory and required in all schedule submissions to the Government:

a. Activity Codes must be Project Level, not Global or EPS level.

b. Calendars must be Project Level, not Global or Resource level.

c. Activity Duration Types must be set to "Fixed Duration & Units".

d. Percent Complete Types must be set to "Physical".

e. Set time periods for P6 for Hours/Day, Hours/Week, Hours/Month and Hours/Year based on Section 01 11 00.00 10 Paragraph "WORKING HOURS".

f. Set Schedule Option for defining Critical Activities to "Longest Path".

g. Set Schedule Option for defining progressed activities to "Retained Logic".

h. Set up cost loading using a single lump sum labor resource. The Price/Unit must be $1/hr, Default Units/Time must be "8h/d", and settings "Auto Compute Actuals" and "Calculate costs from units" selected.

i. Activity ID's must not exceed 10 characters.

j. Activity Names must have the most defining and detailed description within the first 30 characters.

-- End of Section --

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SECTION 01 33 00

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# SECTION 01 33 00

# SUBMITTAL PROCEDURES

## PART 1 GENERAL

### 1.1 SUMMARY

#### 1.1.1 Submittal Information

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be in English, complete, and in sufficient detail to allow ready determination of compliance with Contract requirements. All product information and documents provided in Japanese shall be translated to sufficient detail so native English readers shall be able to understand the major points of the documents provided.

#### 1.1.2 Project Type

The Contractor's Quality Control (CQC) System Manager is to check and approve all items before submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

#### 1.1.3 Submission of Submittals

Schedule and provide submittals requiring Government approval before acquiring the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Safety Data Sheets (SDS) and in compliance with existing laws and regulations.

### 1.2 DEFINITIONS

#### 1.2.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (work) or the start of the next major phase of the construction on a multi-phase

Contract, includes schedules, tabular list of data, or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates of insurance

Surety bonds

List of proposed Subcontractors

List of proposed products

Construction progress schedule

Network Analysis Schedule (NAS)

Submittal register

Schedule of prices or Earned Value Report

Accident Prevention Plan

Work plan

Quality Control(QC) plan

Environmental protection plan

SD-02 Shop Drawings

Drawings, diagrams, and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems, or equipment for some portion of the work.

Samples of warranty language when the Contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for

the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

Design calculations, mix designs, analyses, or other data pertaining to a part of work.

Design submittals, design substantiation submittals, and extensions of design submittals.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product, or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of Contract award for the project.

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports.

Daily logs and checklists.

Final acceptance test and operational test procedure.

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system, or material attesting that product, system or material meets specification requirements. Must be dated after award of project Contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer, or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

Confined space entry permits.

Text of posted operating instructions.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances,

hazards, and safety precautions.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance, and repair of the item.

This data is intended to be incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements, or to establish an administrative mechanism.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

Special requirements necessary to properly close out a construction Contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase Contract.

1.2.2 Approving Authority

Office or designated person authorized to approve submittal.

1.2.3 Work

As used in this section, on- and off-site construction required by Contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that shall review the submittal for the Government. Submit the following in accordance with this section.

SD-01 Preconstruction Submittals

Submittal Register; G

Submittal Register Monthly Update; G

1.4 SUBMITTAL CLASSIFICATION

1.4.1 Government Approved (G)

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting

Officer. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are considered to be "shop drawings."

1.4.2 For Information Only

Submittals not requiring Government approval shall be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.4.3 Sustainability Reporting Submittals (S)

Submittals for Guiding Principle Validation (GPV) or Third Party Certification (TPC) are indicated with an "S" designation. These submittals are for information only and for use as specified in Section 01 33 29 SUSTAINABILITY REPORTING.

Schedule submittals for these items throughout the course of construction as provided; do not wait until closeout.

1.5 PREPARATION

1.5.1 Transmittal Form

Use the attached sample transmittal form in Attachment 01 33 00-A ENG FORM 4025-R for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms are included in the QCS software that the Contractor is required to use for this Contract. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the Contract drawings pertinent to the data submitted for each item.

1.5.2 Identifying Submittals

When submittals are provided by a Subcontractor, the Prime Contractor is to prepare, review and stamp with Contractor's approval all specified submittals prior to submitting for Government approval.

Identify submittals, except sample installations and sample panels, with the following information permanently adhered to or noted on each separate component of each submittal and noted on transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction Contract number.

c. Date of the drawings and revisions.

d. Name, address, and telephone number of Subcontractor, supplier, manufacturer and any other Subcontractor associated with the submittal.

e. Section number of the specification section by which submittal is required.

f. Submittal description (SD) number of each component of submittal.

g. When a resubmission, add alphabetic suffix on submittal description,

for example, submittal 18 would become 18A, to indicate resubmission.

h. Product identification and location in project.

1.5.3 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.5.4 Format for SD-02 Shop Drawings

Provide shop drawings not less than 210 by 297 mm A4 nor more than 1189 by 841 mm, except for full size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless another form is required. Ensure drawings are suitable for reproduction and of a quality to produce clear, distinct lines and letters, with dark lines on a white background.

a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.

b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Present 210 by 297 mm shop drawings sized as part of the bound volume for submittals. Present larger drawings in sets.

1.5.4.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location next to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

Reserve a blank space, no smaller than 50 mm on the right-hand side of each sheet for the Government disposition stamp.

1.5.5 Format of SD-03 Product Data

Present product data submittals for each section and as a complete, bound volume. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

1.5.5.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in metric dimensions. Where product data are included in preprinted catalogs with English units only, submit metric dimensions on separate sheet.

1.5.5.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.5.5.3 Data Submission

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal that is marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of the construction effort.

Submit the manufacturer's instructions before installation.

1.5.6 Format of SD-04 Samples

1.5.6.1 Sample Characteristics

Furnish samples in the following sizes, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 50 by 75 mm: Built up to 210 by 297 mm A4 mm.

c. Sample of Materials Exceeding 210 by 297 mm A4: Cut down to 210 by 297 mm A4 and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 250 mm length or length to be supplied, if less than 250 mm. Examples of linear devices or materials are conduit and handrails.

e. Sample Volume of Nonsolid Materials: 750 mL. Examples of nonsolid

materials are sand and paint.

f. Color Selection Samples:50 by 100 mm. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 1200 by 1200 mm.

h. Sample Installation: 10 sq m.

1.5.6.2 Sample Incorporation

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at the time of use.

Recording of Sample Installation: Note and preserve the notation of any area constituting a sample installation, but remove the notation at the final clean-up of the project.

1.5.6.3 Comparison Sample

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.5.7 Format of SD-05 Design Data

Provide design data and certificates on 210 by 297 mm A4 paper in a bound volume for submittals containing numerous pages.

1.5.8 Format of SD-06 Test Reports

Provide reports on 210 by 297 mm A4 paper in a complete bound volume.

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.5.9 Format of SD-07 Certificates

Provide design data and certificates on 210 by 297 mm A4 paper in a bound volume for submittals containing numerous pages.

1.5.10 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section as a complete, bound volume. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

1.5.10.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.5.11 Format of SD-09 Manufacturer's Field Reports

Provide reports in electronic PDF format. Provide reports on 210 by 297 mm A4 paper in a complete bound volume.

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.5.12 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

1.5.13 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

Provide all dimensions in administrative submittals in metric. Where data are included in preprinted material with English units only, submit metric dimensions on separate sheet.

1.5.14 Source Drawings for Shop Drawings

1.5.14.1 Source Drawings

The entire set of source drawing files (DWG) will not be provided to the Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

1.5.14.2 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for

the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim, and waives to the fullest extent permitted by law any claim or cause of action of any nature against the Government, its agents, or its subconsultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities, or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is responsible for determining if any conflict exists. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished source drawing files, the signed and sealed construction documents govern. Use of these source drawing files does not relieve the Contractor of the duty to fully comply with the contract documents, including and without limitation the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indication of ownership (seals, logos, signatures, initials and dates).

### 1.5.15 Electronic File Format

Provide all submittals in electronic format, with the exception of material samples required for SD-04 Samples items. In addition to the electronic submittal, see paragraph titled QUANTITY OF SUBMITTALS for number of hard copies required. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, and coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is searchable and can be copied. If documents are scanned, optical character resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature or a scan of a signature.

Electronic submittal documents shall all be attached in RMS CM.

## 1.6 QUANTITY OF SUBMITTALS

### 1.6.1 Number of SD-01 Preconstruction Submittal Copies

Unless otherwise specified, submit two sets of administrative submittals.

### 1.6.2 Number of SD-02 Shop Drawing Copies

Submit two copies of submittals of shop drawings requiring review and

approval by a QC organization. Submit two copies of shop drawings requiring review and approval by the Contracting Officer.

1.6.3 Number of SD-03 Product Data Copies

Submit in compliance with quantity requirements specified for shop drawings.

1.6.4 Number of SD-04 Samples

a. Submit two samples, or two sets of samples showing the range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in the technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of nonsolid materials.

1.6.5 Number of SD-05 Design Data Copies

Submit in compliance with quantity requirements specified for shop drawings.

1.6.6 Number of SD-06 Test Report Copies

Submit in compliance with quantity and quality requirements specified for shop drawings, other than field test results that will be submitted with QC reports.

1.6.7 Number of SD-07 Certificate Copies

Submit in compliance with quantity requirements specified for shop drawings.

1.6.8 Number of SD-08 Manufacturer's Instructions Copies

Submit in compliance with quantity requirements specified for shop drawings.

1.6.9 Number of SD-09 Manufacturer's Field Report Copies

Submit in compliance with quantity and quality requirements specified for shop drawings other than field test results that will be submitted with QC reports.

1.6.10 Number of SD-10 Operation and Maintenance Data Copies

Submit five copies of O&M data to the Contracting Officer for review and approval.

1.6.11 Number of SD-11 Closeout Submittals Copies

Unless otherwise specified, submit two sets of administrative submittals.

## 1.7 INFORMATION ONLY SUBMITTALS

Submittals without a "G" designation must be certified by the QC manager and submitted to the Contracting Officer for information-only. Approval of the Contracting Officer is not required on information only submittals. The Contracting Officer will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Government reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

## 1.8 PROJECT SUBMITTAL REGISTER

### 1.8.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. One copy of the submittal register monthly update shall be submitted together with the monthly progress payment requests. Do not change data that is output in columns (c), (d), (e), and (f) as delivered by Government; retain data that is output in columns (a), (g), (h), and (i) as approved. As an attachment, provide a submittal register showing items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM). The Government will provide the initial submittal register in electronic format with the following fields completed, to the extent that will be required by the Government during subsequent usage.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD Number. and type, e.g., SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in each specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Government.

### 1.8.2 Preconstruction Use of Submittal Register

Submit the submittal register. Include the QC plan and the project schedule. Verify that all submittals required for the project are listed

and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for the approving authority to receive submittals.

Column (h) Contractor Approval Date: Date that Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.8.3 Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in the program used by the Contractor with each submittal throughout the contract.

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) Date submittal transmitted.

Column (q) Date approval was received.

1.8.4 Approving Authority Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (l) Date submittal was received.

Column (m) through (p) Dates of review actions.

Column (q) Date of return to Contractor.

1.8.5 Action Codes

1.8.5.1 Government Review Action Codes

"A" - "Approved as submitted"; "Completed"

"B" - "Approved, except as noted on drawings"; "Completed"

"C" - "Approved, except as noted on drawings; resubmission required"; "Resubmit"

"D" - "Returned by separate correspondence"; "Completed"

"E" - "Disapproved (See attached)"; "Resubmit"

"F" - "Receipt acknowledged"; "Completed"

"G" - "Other (Specify)"; "Resubmit"

"X" - "Receipt acknowledged, does not comply with contract requirements"; "Resubmit"

1.8.5.2 Contractor Action Codes

| DESIGN BID BUILD SUBMITTALS | | | |
|---|---|---|---|
| Submittal Classifications shown in UFGS Sections | Submittal Classification | Corresponding SpecsIntact Submittal Register Code which is populated in the SI Submittal Register. Software Limitations: (The software shows one character delineation in the SpecsIntact Submittal Register) | RMS – The following Submittal Classifications are populated in RMS when the SpecsIntact Submittal Data File is pulled into RMS) |
| G | Submittal requires Government Approval | G | GA |
| BLANK | Submittal is For Information Only (FIO) | BLANK | FIO |
| S | Submittal is for documentation of Sustainable requirements | S | S/FIO |

1.8.6 Delivery of Copies

Submit an updated electronic copy of the submittal register to the Contracting Officer with each invoice request. Provide an updated Submittal Register monthly regardless of whether an invoice is submitted.

1.9 VARIATIONS

Variations from contract requirements require Contracting Officer approval pursuant to contract Clause FAR 52.236-21 Specifications and Drawings for Construction, and will be considered where advantageous to the Government.

1.9.1 Considering Variations

Discussion of variations with the Contracting Officer before submission will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. When contemplating a variation that results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out variations may cause the Government to require rejection and removal of such work at no additional cost to the Government.

### 1.9.2 Proposing Variations

When proposing variation, deliver a written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government. Include the DOR's written analysis and approval. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

Check the column "variation" of ENG Form 4025 for submittals that include variations proposed by the Contractor. Set forth in writing the reason for any variations and note such variations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted variations.

### 1.9.3 Warranting that Variations are Compatible

When delivering a variation for approval, the Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

### 1.9.4 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 additional calendar days will be allowed for the Government to consider submittals with variations.

## 1.10 SCHEDULING

Schedule and submit concurrently product data and shop drawings covering component items forming a system or items that are interrelated. Submit pertinent certifications at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional time required for Government reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.

b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but that have been omitted from the register or marked "N/A."

c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

d. Except as specified otherwise, allow a review period, beginning with receipt by the approving authority, that includes at least 10 working days for submittals for QC manager approval, and 30 calendar days for submittals where the Contracting Officer is the approving authority. The period of review for submittals with the Contracting Officer approval begins when the Government receives the submittal from the QC organization.

## 1.11 GOVERNMENT APPROVING AUTHORITY

When approving authority is the Contracting Officer, the Government shall:

a. Note date on which submittal was received.

b. Review submittals for approval within scheduling period specified and only for conformance with project design concepts and compliance with Contract documents.

c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. Two copies of the submittal shall be retained by the Contracting Officer and one copy of the submittal shall be returned to the Contractor.

### 1.11.1 Review Notations

Contracting Officer review shall be completed within 30 calendar days after receipt of submission by the Government. Submittals shall be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" "or approved, except as noted, resubmittal not required," authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked "not approved" or "disapproved," or "revise and resubmit," indicate noncompliance with the Contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

d. Submittals marked "not reviewed" shall indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" shall be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

## 1.12 DISAPPROVED OR REJECTED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned

submittals to constitute a change to the Contract drawings or specifications; notice as required under the Contract clause CHANGES, is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

## 1.13 APPROVED/ACCEPTED SUBMITTALS

The Contracting Officer's approval or acceptance of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory.

Approval or acceptance shall not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this Contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment shall be considered unless accompanied by an explanation of why a substitution is necessary.

## 1.14 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any Contract requirements. Before submitting samples, assure that the materials or equipment shall be available in quantities required in the project. No change or substitution shall be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, shall be returned to the Contractor, at his expense, upon completion of the Contract. Samples not approved shall also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests shall be sufficient cause for refusal to consider, under this Contract, any further samples of the same brand or make of that material. Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet Contract requirements shall automatically void previous approvals. Replace such materials or equipment to meet Contract requirements.

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the Contract.

## 1.15 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work shall not be made if required approvals have not been obtained.No payment for materials incorporated in the work will be made if all required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

## 1.16 STATUS REPORT ON MATERIALS ORDERS

Within 15 calendar days after notice to proceed, submit, for approval by the Contracting Officer, an initial material status report on all materials orders. This report shall be updated and re-submitted every 30 calendar days as the status on material orders changes.

Report to include list, in chronological order by need date, materials orders necessary for completion of the Contract. The following information shall be required for each material order listed:

a. Material name, supplier, and invoice number.

b. Bar chart line item or CPM activity number affected by the order.

c. Delivery date needed to allow directly and indirectly related work to be completed within the Contract performance period.

d. Current delivery date agreed on by supplier.

e. When item d exceeds item c, the effect that delayed delivery date will have on Contract completion date.

f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or Subcontract) with other suppliers.

## 1.17 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets Contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheets(s)

SIGNATURE: _____

TITLE: _____

DATE: _____

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

U.S. Army Corps of Engineers (USACE)

**TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE**

For use of this form, see ER 415-1-10; the proponent agency is CECW-CE.

DATE

TRANSMITTAL NO.

**SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS** (*This section will be initiated by the contractor*)

TO:

FROM:

CONTRACT NO.

CHECK ONE:
- ☐ THIS IS A NEW TRANSMITTAL
- ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL _____

SPECIFICATION SEC. NO. (*Cover only one section with each transmittal*)

PROJECT TITLE AND LOCATION

THIS TRANSMITTAL IS FOR: (*Check one*)
☐ FIO ☐ GA ☐ DA ☐ CR ☐ DA/CR ☐ DA/GA

| ITEM NO. (*See Note 3*) a. | DESCRIPTION OF SUBMITTAL ITEM (*Type size, model number/etc.*) b. | SUBMITTAL TYPE CODE (*See Note 8*) c. | NO. OF COPIES d. | CONTRACT DOCUMENT REFERENCE | | CONTRACTOR REVIEW CODE g. | VARIATION Enter "Y" if requesting a variation (*See Note 6*) h. | USACE ACTION CODE (*Note 9*) i. |
|---|---|---|---|---|---|---|---|---|
| | | | | SPEC. PARA. NO. e. | DRAWING SHEET NO. f. | | | |
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REMARKS

I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

NAME OF CONTRACTOR

SIGNATURE OF CONTRACTOR

**SECTION II - APPROVAL ACTION**

ENCLOSURES RETURNED (*List by item No.*)

NAME AND TITLE OF APPROVING AUTHORITY

SIGNATURE OF APPROVING AUTHORITY

DATE

## INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each Transmittal shall be numbered consecutively. The Transmittal Number typically includes two parts separated by a dash (-). The first part is the specification section number. The second part is a sequential number for the submittals under that spec section. If the Transmittal is a resubmittal, then add a decimal point to the end of the original Transmittal Number and begin numbering the resubmittal packages sequentially after the decimal.

3. The "Item No." for each entry on this form will be the same "Item No." as indicated on ENG FORM 4288-R.

4. Submittals requiring expeditious handling will be submitted on a separate ENG Form 4025-R.

5. Items transmitted on each transmittal form will be from the same specification section. Do not combine submittal information from different specification sections in a single transmittal.

6. If the data submitted are intentionally in variance with the contract requirements, indicate a variation in column h, and enter a statement in the Remarks block describing he detailed reason for the variation.

7. ENG Form 4025-R is self-transmitting - a letter of transmittal is not required.

8. When submittal items are transmitted, indicate the "Submittal Type" (*SD-01 through SD-11*) in column c of Section I.
   Submittal types are the following:
   SD-01 - Preconstruction SD-02 - Shop Drawings SD-03 - Product Data SD-04 - Samples SD-05 - Design Data SD-06 - Test Reports
   SD-07 - Certificates SD-08 - Manufacturer's Instructions SD-09 - Manufacturer's Field Reports SD-10 - O&M Data SD-11 - Closeout

9. For each submittal item, the Contractor will assign Submittal Action Codes in column g of Section I. The U.S. Army Corps of Engineers approving authority will assign Submittal Action Codes in column i of Section I. The Submittal Action Codes are:

   A -- Approved as submitted.
   B -- Approved, except as noted on drawings. Resubmission not required.
   C -- Approved, except as noted on drawings. Refer to attached comments. Resubmission required.
   D -- Will be returned by separate correspondence.
   E -- Disapproved. Refer to attached comments.
   F -- Receipt acknowledged.
   X -- Receipt acknowledged, does not comply with contract requirements, as noted.
   G -- Other action required *(Specify)*
   K -- Government concurs with intermediate design. (*For D-B contracts*)
   R -- Design submittal is acceptable for release for construction. (*For D-B contracts*)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract.

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| | | 01 11 00.00 10 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Initial Site Conditions Photos | 1.11 | | | | | | | | | | | | | | |
| | | | Key Personnel Qualifications | 1.7 | G | | | | | | | | | | | | | |
| | | | Conformed Drawings Submittal | 1.10.2 | | | | | | | | | | | | | | |
| | | | INDOOR AIR QUALITY (IAQ) | 1.10.3 | G | | | | | | | | | | | | | |
| | | | MANAGEMENT PLAN | | | | | | | | | | | | | | | |
| | | | SD-07 Certificates | | | | | | | | | | | | | | | |
| | | | Monthly Progress Photos | 1.11 | | | | | | | | | | | | | | |
| | | | SD-11 Closeout Submittals | | | | | | | | | | | | | | | |
| | | | Construction Completion Photos | 1.11 | | | | | | | | | | | | | | |
| | | 01 20 00 | SD-07 Certificates | | | | | | | | | | | | | | | |
| | | | Bill Of Lading | 3.2 | G | | | | | | | | | | | | | |
| | | | Bill Of Lading | 3.2 | G | | | | | | | | | | | | | |
| | | 01 32 01.00 10 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Project Scheduler Qualifications | 1.3 | G | | | | | | | | | | | | | |
| | | | Preliminary Project Schedule | 3.4.1 | G | | | | | | | | | | | | | |
| | | | Initial Project Schedule | 3.4.2 | G | | | | | | | | | | | | | |
| | | | Periodic Schedule Update | 3.6.2 | G | | | | | | | | | | | | | |
| | | 01 33 00 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Submittal Register | 1.8 | G | | | | | | | | | | | | | |
| | | | Submittal Register Monthly | 1.8.1 | G | | | | | | | | | | | | | |
| | | | Update | | | | | | | | | | | | | | | |
| | | 01 33 29 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Sustainability Action Plan | 1.4.1 | G | | | | | | | | | | | | | |
| | | | SD-11 Closeout Submittals | | | | | | | | | | | | | | | |
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| | | 01 33 29 | High Performance and | 1.5.2.2 | G | | | | | | | | | | | | | |
| | | | Sustainable Building Checklist | | | | | | | | | | | | | | | |
| | | | Final Sustainability eNotebook | 1.5.2.2 | G | | | | | | | | | | | | | |
| | | 01 35 13 | SD-04 Samples | | | | | | | | | | | | | | | |
| | | | Model Unit | 3.1.3 | | | | | | | | | | | | | | |
| | | 01 35 26 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Accident Prevention Plan (APP) | 1.8 | G | | | | | | | | | | | | | |
| | | | Final IAQ Management Plan | 1.16 | S | | | | | | | | | | | | | |
| | | | Indoor Air Quality (IAQ) | 1.16 | G | | | | | | | | | | | | | |
| | | | Management Plan | | | | | | | | | | | | | | | |
| | | | SD-06 Test Reports | | | | | | | | | | | | | | | |
| | | | Accident Reports | 1.12.2 | G | | | | | | | | | | | | | |
| | | | LHE Inspection Reports | 1.12.3 | | | | | | | | | | | | | | |
| | | | Monthly Exposure Reports | 1.5 | G | | | | | | | | | | | | | |
| | | | SD-07 Certificates | | | | | | | | | | | | | | | |
| | | | Crane Operators/Riggers | 1.7.5 | | | | | | | | | | | | | | |
| | | | Activity Hazard Analysis (AHA) | 1.9 | G | | | | | | | | | | | | | |
| | | | Certificate of Compliance | 1.12.4 | | | | | | | | | | | | | | |
| | | | Hot Work Permit | 1.13 | | | | | | | | | | | | | | |
| | | | Standard Lift Plan | 1.12.4 | G | | | | | | | | | | | | | |
| | | | Certifications | 3.10.2 | | | | | | | | | | | | | | |
| | | | Licenses | 3.10.2 | | | | | | | | | | | | | | |
| | | 01 45 00.00 10 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Contractor Quality Control (CQC) | 3.2 | G | | | | | | | | | | | | | |
| | | | Plan | | | | | | | | | | | | | | | |
| | | | SD-06 Test Reports | | | | | | | | | | | | | | | |

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| | | 01 45 00.00 10 | Verification Statement | 3.9.2 | | | | | | | | | | | | | | |
| | | 01 50 00 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Construction Site Plan | 1.3 | G | | | | | | | | | | | | | |
| | | | Traffic Control Plan | 3.4.1 | G | | | | | | | | | | | | | |
| | | | Temporary Utility Connections Plan | 3.3.2 | G | | | | | | | | | | | | | |
| | | 01 57 19.01 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Preconstruction Survey | 1.8.1 | | | | | | | | | | | | | | |
| | | | Regulatory Notifications | 1.8.2 | | | | | | | | | | | | | | |
| | | | Environmental Protection Plan | 1.9 | G | | | | | | | | | | | | | |
| | | | Environmental Protection Plan | 3.8.2.1 | G | | | | | | | | | | | | | |
| | | | Environmental Manager Qualifications | 1.8.4 | G | | | | | | | | | | | | | |
| | | | Licenses/Permits/Notifications | 1.8.3 | G | | | | | | | | | | | | | |
| | | | Written Assessment Of Friable Asbestos Disturbance | 3.11 | | | | | | | | | | | | | | |
| | | | SD-06 Test Reports | | | | | | | | | | | | | | | |
| | | | Laboratory Analysis | 3.8.1.1.2 | | | | | | | | | | | | | | |
| | | | Nonhazardous Solid Waste Diversion Report | 3.7.2 | | | | | | | | | | | | | | |
| | | | SD-07 Certificates | | | | | | | | | | | | | | | |
| | | | Asbestos Certification | 1.7.1 | | | | | | | | | | | | | | |
| | | | Lead Certification | 1.7.2 | | | | | | | | | | | | | | |
| | | | SD-11 Closeout Submittals | | | | | | | | | | | | | | | |
| | | | Environmental Records Binder | 1.8.5 | | | | | | | | | | | | | | |
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| | | 01 57 19.01 | Environmental Records Binder | 1.10 | | | | | | | | | | | | | | |
| | | | Environmental Records Binder | 3.2.1 | | | | | | | | | | | | | | |
| | | | Environmental Records Binder | 3.8.1 | | | | | | | | | | | | | | |
| | | | Environmental Records Binder | 3.8.3.4 | | | | | | | | | | | | | | |
| | | 01 74 19 | SD-01 Preconstruction Submittals | | | | | | | | | | | | | | | |
| | | | Waste Management Plan | 1.6 | G | | | | | | | | | | | | | |
| | | | SD-11 Closeout Submittals | | | | | | | | | | | | | | | |
| | | | Records | 1.7 | | | | | | | | | | | | | | |
| | | 01 78 00 | SD-03 Product Data | | | | | | | | | | | | | | | |
| | | | Warranty Management Plan | 1.7.1 | G | | | | | | | | | | | | | |
| | | | Warranty Tags | 1.7.5 | | | | | | | | | | | | | | |
| | | | Final Cleaning | 3.8 | | | | | | | | | | | | | | |
| | | | Spare Parts Data | 1.5 | | | | | | | | | | | | | | |
| | | | SD-08 Manufacturer's Instructions | | | | | | | | | | | | | | | |
| | | | Instructions | 1.7.1 | | | | | | | | | | | | | | |
| | | | SD-10 Operation and Maintenance | | | | | | | | | | | | | | | |
| | | | Data | | | | | | | | | | | | | | | |
| | | | Operation and Maintenance | 3.7 | G | | | | | | | | | | | | | |
| | | | Manuals | | | | | | | | | | | | | | | |
| | | | SD-11 Closeout Submittals | | | | | | | | | | | | | | | |
| | | | As-Built Drawings | 3.1 | G | | | | | | | | | | | | | |
| | | | Record Drawings | 3.3 | G | | | | | | | | | | | | | |
| | | | As-Built Record of Equipment | 1.7.1 | G | | | | | | | | | | | | | |
| | | | and Materials | | | | | | | | | | | | | | | |
| | | | As-Built Record of Equipment | 3.6 | G | | | | | | | | | | | | | |
| | | | and Materials | | | | | | | | | | | | | | | |

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| | | 01 78 00 | Final Approved Shop Drawings | 3.4 | G | | | | | | | | | | | | | |
| | | | Construction Contract | 3.5 | G | | | | | | | | | | | | | |
| | | | Specifications | | | | | | | | | | | | | | | |
| | | | Interim DD FORM 1354 | 3.9 | G | | | | | | | | | | | | | |
| | | | Checklist for DD FORM 1354 | 3.9 | G | | | | | | | | | | | | | |
| | | 01 78 23 | SD-10 Operation and Maintenance | | | | | | | | | | | | | | | |
| | | | Data | | | | | | | | | | | | | | | |
| | | | O&M Database | 1.4 | G | | | | | | | | | | | | | |
| | | | Training Plan | 3.1.1 | G | | | | | | | | | | | | | |
| | | | Training Outline | 3.1.3 | G | | | | | | | | | | | | | |
| | | | Training Content | 3.1.2 | G | | | | | | | | | | | | | |
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| | | | SD-03 Product Data | | | | | | | | | | | | | | | |
| | | | Gravity Pipe | 2.2.1 | G | | | | | | | | | | | | | |
| | | | SD-07 Certificates | | | | | | | | | | | | | | | |
| | | | Joints and Jointing Material | 2.2.1.1.2 | G | | | | | | | | | | | | | |
| | | 33 40 00 | SD-07 Certificates | | | | | | | | | | | | | | | |
| | | | Leakage Test | 3.6.1.1 | G | | | | | | | | | | | | | |
| | | | Jointing Material | 2.1.1 | G | | | | | | | | | | | | | |
| | | | Post-Installation Inspection | 3.6.2.1.1 | G | | | | | | | | | | | | | |
| | | | Report | | | | | | | | | | | | | | | |
| | | | Placing Pipe | 3.3 | | | | | | | | | | | | | | |
| | | 33 71 02 | SD-03 Product Data | | | | | | | | | | | | | | | |
| | | | Extra-High voltage cable | 2.4 | G | | | | | | | | | | | | | |
| | | | terminations | | | | | | | | | | | | | | | |
| | | | Live end caps | 3.11 | G | | | | | | | | | | | | | |
| | | | Precast concrete structures | 2.8.2.1 | G | | | | | | | | | | | | | |

# SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Courtney

CONTRACTOR

| ACTIVITY NO | TRANSMITTAL NO | SPEC SECT | DESCRIPTION ITEM SUBMITTED | PARAGRAPH # | CLASSIFICATION | GOVT OR A/E REVWR | CONTRACTOR: SCHEDULE DATES | | | CONTRACTOR ACTION | | | APPROVING AUTHORITY | | | | MAILED TO CONTR/ | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SUBMIT | APPROVAL NEEDED BY | MATERIAL NEEDED BY | ACTION CODE | DATE OF ACTION | DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR | DATE FWD TO OTHER REVIEWER | DATE RCD FROM OTH REVIEWER | ACTION CODE | DATE OF ACTION | DATE RCD FRM APPR AUTH | |
| (a) | (b) | (c) | (d) | (e) | (f) | | (g) | (h) | (i) | (j) | (k) | (l) | (m) | (n) | (o) | (p) | (q) | (r) |
| | | 33 71 02 | Sealing Material | 2.8.2.4 | | | | | | | | | | | | | | |
| | | | Manhole frames and covers | 2.8.3 | G | | | | | | | | | | | | | |
| | | | Cable supports | 2.9 | G | | | | | | | | | | | | | |
| | | | Protective Devices and Coordination | 2.13 | G | | | | | | | | | | | | | |
| | | | SD-06 Test Reports | | | | | | | | | | | | | | | |
| | | | Field Acceptance Checks and Tests | 3.15.1 | | | | | | | | | | | | | | |

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-- End of Section Table of Contents --

# SECTION 01 33 29

# SUSTAINABILITY REQUIREMENTS AND REPORTING

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)

| | |
|---|---|
| HPSB Guiding Principles | (2016) Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| UFC 1-200-02 | (2020) High Performance and Sustainable Building Requirements |

U.S. DEPARTMENT OF ENERGY (DOE)

| | |
|---|---|
| Energy Star | (1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP) |

### 1.2 SUMMARY

This section includes requirements for Sustainability documentation and reporting submittals per the federally mandated High Performance and Sustainable Building (HPSB) or HPSB "Guiding Principles" (GP),in accordance with UFC 1-200-02 High Performance and Sustainable Building Requirements.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sustainability Action Plan; G

SD-11 Closeout Submittals

High Performance and Sustainable Building Checklist; G
Final Sustainability eNotebook; G

### 1.4 GUIDING PRINCIPLES VALIDATION (GPV)

Provide the following sustainability activities and documentation to verify achievement of HPSB Guiding Principles Validation (GPV):

### 1.4.1 Sustainability Action Plan

Include the following information in the Sustainability Action Plan:

a. Analysis of each HPSB Guiding Principles and how project will comply. Final government approved narrative(s) must be included in the HPSB Checklist submittal.
b. Name and contact information for: Contractor's Point of Contact (POC) ensuring sustainability goals are accomplished and documentation is assembled.
c. HPSB Checklist. No changes to the HPSB Checklist are allowed without approval from the Contracting Officer, in accordance with Section 01 33 00 SUBMITTAL REQUIREMENTS. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved HPSB Guiding Principles for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.
d. Documentation of all work required to incorporate the applicable HPSB Guiding Principles requirements indicated on the HPSB Checklist and in this contract.
e. Indoor Air Quality plan.

## 1.5 SUSTAINABILITY SUBMITTALS

### 1.5.1 High Performance Sustainable Building (HPSB) Checklist

Provide construction documentation that provides proof of, and supports compliance with, the completed HPSB Checklist. Submit updated HPSB Checklist with each Sustainability eNotebook submittal. Include the final HPSB Checklist(s) with the interim DD1354 Real Property Record Submittal.

### 1.5.2 Sustainability eNotebook

The Sustainability eNotebook is an electronic organizational file that serves as a repository for all required sustainability submittals. To support documentation of compliance with an approved HPSB and TPC checklist, provide and maintain a comprehensive and current Sustainability eNotebook. Include all required data in Sustainability eNotebook, to support full compliance with the HPSB Guiding Principles Requirements, including:

a. HPSB checklist
b. Sustainability Action Plan
c. Calculations
d. Labels
e. Sustainability submittals

#### 1.5.2.1 Sustainability eNotebook Format

Provide Sustainability eNotebook in the form of an Adobe PDF file; bookmark each HPSB Guiding Principles Requirement and sub-bookmark at each document. Match format to HPSB Guiding Principles numbering system indicated herein. Maintain up-to-date information, such as spreadsheets, templates, with each current submittals.

Contracting Officer may deduct from the monthly progress payment accordingly if Sustainability eNotebook information is not current and on track per project goals.

#### 1.5.2.2 Sustainability eNotebook Submittal Schedule

Provide Sustainability eNotebook Submittals at the following milestones of the project:

a. Final Sustainability eNotebook
Submit updated Sustainability eNotebook with updated High Performance and Sustainable Building Checklist at Beneficial Occupancy Date (BOD). Final progress payment retainage may be held by Contracting Officer until Final Sustainability construction phase documentation is complete.

## 1.6 DOCUMENTATION REQUIREMENTS

a. Incorporate each of the applicable UFC 1-200-02 HPSB Guiding Principles requirements into project and provide documentation that proves compliance with each listed requirement. For life-cycle cost analysis requirements, one document with all analyses is acceptable, with Contracting Officer approval.

b. For the following items, Japanese acceptable alternatives are listed. For all other items, see UFC 1-200-02.

### 1.6.1 Commissioning (Cx)

Develop and incorporate Commissioning requirements into the documents, in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

### 1.6.2 Energy Efficient Products

Products do not have to have the Energy Star label, but they shall have Federal Energy Management Program (FEMP) recommended efficiencies. Energy efficient products can be referenced at: https://www.energy.gov/eere/femp/federal-energy-management-program and http://www.energystar.gov/.

### 1.6.3 Indoor Water Use

Products do not have to have the EPA WaterSense label, but they shall comply with WaterSense efficiency requirements.

### 1.6.4 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

F 4-Star and 4VOC combined ratings are acceptable Japanese alternatives for low-VOC materials. For Construction submittal documentation, provide certifications or labels that demonstrate compliance with cited requirements.

# PART 2 PRODUCTS

Not used.

# PART 3 EXECUTION

## 3.1 SUSTAINABILITY COORDINATION

Provide sustainability focus and coordination at all meetings to achieve sustainability goals. Coordinate meeting requirements with other UFGS

Sections meeting requirements in this project. Review HPSB Checklist, Sustainability Action Plan, and completeness status of Sustainability eNotebook at the following meetings:

a. Pre-Construction Conference

b. Construction Quality Control Meetings

c. Facility Turnover Meetings

Conduct review no later than 60 days before final turnover and identify any outstanding issues that affect correct completion of all documentation. Conduct corrective actions prior to turnover, to ensure all requirements are achieved.

-- End of Section --

# Sustainability eNotebook

**Repair Courtney Tower, 4511, Kadena Air Base**

**Exp Federal Project Number:**

CHI-22022320-A0

**Prepared By:**

Exp Federal
205 N. Michigan Ave, Suite 3800
Chicago, IL 60601

**Issued For:**

Final Design Submittal

**Date Submitted:**

September 2023

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## A. High Performance and Sustainable Building (HPSB) Checklist – AF Scorecard

The attached document is meant to satisfy the requirement for use of the Army Energy & Sustainability Report Card to track and report compliance with the requirements of *UFC 1-200-02 High Performance and Sustainable Building Requirements* for the Repair Courtney Tower project at Kadena Air Base, Okinawa, Japan.

# Air Force Sustainability Requirements Scoresheet

## HPSB COMPLIANCE (Updated Jan 2017)

* required entry

**General Information**

Federal Requirements Complete

| | |
|---|---|
| CABT184709 | Project ID (e.g. ABCD12345) |
| 000000000000050102 | Real Property Unique ID (RPUID) |
| 4511 | Facility Number |
| Courtney Tower | Building Name |
| Kadena AB | Installation |
| Okinawa | City |
| Japan | State |
| No | CONUS |
| PACAF | MAJCOM |
| USACE | Construction Agent |
| Gaughran, Blake P | AFCEC DM/CM (Last Name, First Name) |
| TBC | PA |
| 145,772 | Building Size (SF) |
| 2024 | Program Year (FY####) |
| Design Complete | Project Phase |
| 12/01/22 | Design Started (MM/DD/YY) |
| 12/27/25 | BOD (MM/DD/YY) |
| Not Certifying | Guiding Principles Compliance Certification Method |
| | Date Project Registered (MM/DD/YY) |
| | Date Project Certified (MM/DD/YY) |
| 96% | HPSB Compliant |
| 41% | Energy Efficiency Achieved (% below ANSI/ASHRAE/IESNA Standard 90.1-2013) |
| 2017V1 | Scoresheet version |

# Air Force Sustainability Requirements Scoresheet

## HPSB COMPLIANCE (Updated Jan 2017)

* required entry

| Color Coding: See Instructions Tab for more detail | |
|---|---|
| Drop-Down Box | Yes or N/A |
| No Entry Required | No |
| Custom Entry | Recommended not Required |

**90.1-2013**

### HPSB I: Employ Integrated Design Principles (UFC 1-200-02 para 2-2)

Total Points 2 — Possible Points 2

| | | | |
|---|---|---|---|
| Yes | HPSB I.1 | **Integrated Design** | 1 |
| Yes | HPSB I.2 | **Commissioning** | 1 |

### HPSB II: Optimize Energy Performance (UFC 1-200-02 para 2-3)

Total Points 5 — Possible Points 5

| | | | |
|---|---|---|---|
| Yes | HPSB II.1 | **Energy Efficiency** | 1 |
| | | Yes — Reduce energy use 30% below ANSI/ASHRAE/IESNA Standard 90.1-2013 or IECC, or if not - achieve maximum energy efficiency that is lifecycle cost effective | |
| | | 40.5% — Insert percentage below ANSI/ASHRAE/IESNA Standard 90.1-2013 or IECC, in terms of energy use (e.g. 32) | |
| | | 61.3 — Insert building energy intensity (kBtu/yr-sqft) calculated IAW 10 CFR 433 | |
| | | N/A — Roof Attributes (Recommended) | |
| | | Select roof types (Check below) | |
| | | ☐ Cool roof ☐ Solar electric ☐ Solar Passive ☐ Green roof ☐ Solar thermal | |
| | | **Energy Efficient Products** | 1 |
| | | Yes | |
| N/A | HPSB II.2 | **On-site Renewable Energy** | 1 |
| | | N/A — Installed renewable energy elements or projects were not lifecycle cost effective | |
| | | Renewable energy types (check below) | |
| | | ☐ Solar PV ☐ Geothermal ☐ Hydro ☐ Waste to Energy ☐ Solar CP ☐ GSHP ☐ Wind ☐ Renewables were not lifecycle cost effective ☐ Solar Thermal Electric | |
| | | 0.0 — Insert generation capacity (kW) | |
| | | 0.0% — Insert percentage of total building | |
| N/A | HPSB II.3 | **On-site Renewable Energy - Solar Hot Water Heater System** | 1 |
| | | N/A — Installed solar hot water heater system or found installation not lifecycle cost effective | |
| | | 0.0 — Insert generation capacity (MMBtu/yr) | |
| | | 0.0% — Insert percentage of demand | |
| Yes | HPSB II.4 | **Metering** | 1 |
| | | Yes — Electric Metering: Select N/A if no service | |
| | | N/A — Natural Gas Metering: Select N/A if no service | |
| | | N/A — Steam Metering: Select N/A if no service | |

### HPSB III: Protect and Conserve Water (UFC 1-200-02 para 2-4)

Total Points 6 — Possible Points 6

| | | | |
|---|---|---|---|
| Yes | HPSB III.1 | **Indoor Water** | 1 |
| Yes | | **Indoor Water Metering** | 1 |
| N/A | HPSB III.2 | **Outdoor Water** | 1 |
| N/A | | **Outdoor Water Metering** | 1 |
| N/A | HPSB III.3 | **Alternative Water** | 1 |
| N/A | HPSB III.4 | **Stormwater Management (LID Documentation per UFC 3-210-10)** | 1 |
| | | 0.0 — Change in Impervious Area (SF) | |
| | | $0.00 — Pre-Award Cost Estimate ($) | |
| | | N/A — Project addressed EISA 438 | |
| | | EISA Technical Constraints | |
| | | ☐ Retaining stormwater impact receving water flow ☐ Shallow bedrock, contaminated soil, high ground water table, underground utilities ☐ Soil infiltration capacity limited ☐ Site too small to infiltrate significant volume ☐ Non-potable water demand to small ☐ Structural, plumbing, and other mods not feasible ☐ State or local restrict water harvesting ☐ State or local restrict use of green infrastructure or LID ☐ Other | |
| | | 0.0% — Percent Increase in Stormwater Runoff for 95 Percentile Storm (%) -or- Percent Increase in Stormwater Runoff from continuous simulation model, published data, studies, or other established tools (Reference UFC 3-210-10 Figure 2-1 Implementation of EISA Section 438) | |
| | | On-Site — LID Features Locations | |
| | | 0 — Integrated Management Practices Employed | |

# Air Force Sustainability Requirements Scoresheet

## HPSB COMPLIANCE (Updated Jan 2017)

* required entry

- [ ] Bio-Retention
- [ ] Dry Wells
- [ ] Filter Strips
- [ ] Grassed Swells
- [ ] Infiltration Trench
- [ ] Inlet Pollution Removal Device
- [ ] Permeable Pavement/Pavers
- [ ] Rain Barrels/Cisterns
- [ ] Soil Amendments
- [ ] Tree Box Filters
- [ ] Vegetated Buffers
- [ ] Vegetated Roof
- [ ] Other

| | |
|---|---|
| $0.00 | Final LID Construction Cost ($) |
| 0 | Post Construction Analysis (Name of DOR) |

| | | | | |
|---|---|---|---|---|
| **HPSB IV: Enhance Indoor Environmental Quality (UFC 1-200-02 para 2-5)** | | | | |
| Total Points | 8 | | Possible Points | 8 |
| Yes | HPSB IV.1 | **Thermal Comfort** | | 1 |
| Yes | HPSB IV.2 | **Ventilation** | | 1 |
| N/A | HPSB IV.3 | **Daylighting** | | 1 |
| N/A | HPSB IV.4 | **Moisture Control** | | 1 |
| Yes | HPSB IV.5 | **Low Emitting Materials** | | 1 |
| Yes | HPSB IV.6 | **Protect Indoor Air Quality during Construction** | | 1 |
| Yes | HPSB IV.7 | **Environmental Tobacco Smoke Control** | | 1 |
| Yes | HPSB IV.8 | **Occupant Health and Wellness** | | 1 |
| **HPSB V: Reduce Environmental Impact of Materials (UFC 1-200-02 para 2-6)** | | | | |
| Total Points | 4 | | Possible Points | 5 |
| Yes | HPSB V.1 | **Recycled Content** | | 1 |
| Yes | HPSB V.2 | **Biologically-based Products** | | 1 |
| Yes | HPSB V.3 | **Ozone Depleting Substances** | | 1 |
| Yes | HPSB V.4 | **Waste and Materials Management - Recycling** | | 1 |
| No | HPSB V.5 | **Waste and Materials Management - Divert 60% from Disposal** | | 1 |
| | | N/A | 60% or greater diverted | |
| | | 1.0% | Insert percentage diverted from landfill | |
| **HPSB VI: Address Climate Change Risk (UFC 1-200-02 para 2-7)** | | | | |
| Total Points | 1 | | Possible Points | 1 |
| Yes | HPSB VI.1 | **Address Climate Change Risk** | | 1 |
| | | | Possible Points | **27** |
| 26 | **Federal Requirements - Yes or N/A** | | | |
| 1 | **Federal Requirements - No** | | | |
| 96% | **Percentage of Federal Requirements Met** | | | |

## Federal Requirements for High Performance and Sustainable Buildings (HPSB) & UFC 1-200-02

Instructions: Provide a common or project specific justification for an element to be non-applicable, when completed, the Scoresheet tab will allow an N/A response.

| Justification for Non-Applicable Answers | | Common Justification | Project Specific Justification | Complete? |
|---|---|---|---|---|
| **HPSB I: Employ Integrated Design Principles (UFC 1-200-02, 2-2)** | | | | |
| HPSB I.1 | **Integrated Design** | | | Applicable |
| HPSB I.2 | **Commissioning** | | | Applicable |
| **HPSB II: Optimize Energy Performance (UFC 1-200-02, 2-3)** | | | | |
| HPSB II.1 | **Energy Efficiency** | | | Applicable |
| HPSB II.1 | **Energy Efficient Products** | | | Applicable |
| HPSB II.2 | **On-site Renewable Energy** | NA LCCE | | Yes |
| HPSB II.3 | **On-site Renewable Energy - Solar Hot Water Heater System** | NA LCCE | | Yes |
| HPSB II.4 | **Metering** | | | |
| HPSB II.4 | Electric Metering: Select N/A if no service | | | Applicable |
| HPSB II.4 | Natural Gas Metering: Select N/A if no service | NA Mission Restriction | No gas service provided to project. | Yes |
| HPSB II.4 | Steam Metering: Select N/A if no service | NA Mission Restriction | No steam service provided to project. | Yes |
| **HPSB III: Protect and Conserve Water (UFC 1-200-02, 2-4)** | | | | |
| HPSB III.1 | **Indoor Water** | | | Applicable |
| HPSB III.1 | Indoor Water Metering: Select N/A if no service | | | Applicable |
| HPSB III.2 | **Outdoor Water** | NA Mission Restriction | No landscaping | Yes |
| HPSB III.2 | Outdoor Water Metering: Select N/A if no service | Not in scope | | Yes |
| HPSB III.3 | **Alternative Water** | Not in scope | | Yes |
| HPSB III.4 | **Stormwater Management** | | | |
| HPSB III.4 | Project addressed EISA 438 | Optional meausure. Not being pursued. | | Yes |
| **HPSB IV: Enhance Indoor Environmental Quality (UFC 1-200-02, 2-5)** | | | | |
| HPSB IV.1 | **Thermal Comfort** | | | Applicable |
| HPSB IV.2 | **Ventilation** | | | Applicable |
| HPSB IV.3 | **Daylighting** | Optional Measure. Not being pursued. | | Yes |
| HPSB IV.4 | **Moisture Control** | Optional measure. Not being pursued. | | Yes |
| HPSB IV.5 | **Low Emitting Materials** | | | Applicable |
| HPSB IV.6 | **Protect Indoor Air Quality during Construction** | | | Applicable |
| HPSB IV.8 | **Occupant Health and Wellness** | | | Applicable |
| **HPSB V: Reduce Environmental Impact of Materials (UFC 1-200-02, 2-6)** | | | | |
| HPSB V.1 | **Recycled Content** | | | Applicable |
| HPSB V.2 | **Biologically based products** | | | Applicable |
| HPSB V.3 | **Ozone Depleting Substances** | | | Applicable |
| HPSB V.4 | **Waste and Materials Management - Recycling** | | | Applicable |
| HPSB V.5 | **Waste and Materials Management - Divert 60% from Disposal** | Optional measure. Not being pursued | | Applicable |
| **HPSB VI: Adress Climate Change Riskd (UFC 1-200-02, 2-7)** | | | | |
| HPSB VI.1 | **Address Climate Change Risk** | Project not in flood zone. No climate risk. | | Applicable |

## B. Sustainability Action Plan

The Sustainability Action Plan includes the following information:

1. Analysis of each HPSB Guiding Principles Requirements and detail of how the project will comply are found below, as well as in the attached Sustainability Design Narrative.
   - Integrated Design Process
     - The design will include required demolition, new work, repairs and renovation across architectural, civil, structural, interior design, fire protection, mechanical and electrical discipline.
   - Commissioning
     - Commissioning is scheduled for completion as part of the HPSB Checklist. A Cx Agent has will commission the following systems:
       - Mechanical
       - Electrical
       - Plumbing
       - Building envelope
   - Energy Efficient Products
     - ENERGY STAR products or appliances to be used to satisfy UFC requirement. GC will provide construction submittal documentation with proof products are labeled energy efficient.
   - Utility Meter Locations
     - Two domestic water service meters provided by utility company. The meters are located on sheet PP101.
     - Electricity is metered once for the entire building. This meter is located on sheet EP101.
     - No gas service provided to building.
   - Stormwater Management
     - No LID measures to be implemented on this project. The project design analysis does not include a statement that *UFC 3-210-10 Low Impact Development, With Change 3* will be met.
   - Ventilation and Thermal Comfort
     - The project design analysis includes a statement that *UFC 3-410-01 Heating, Ventilating, and Air-Conditioning Systems* will be met. See Design Analysis – 2.6 Mechanical.
   - Daylighting and Lighting Controls
     - The project design analysis includes a statement that *UFC 3-530-01, Design: Interior and Exterior Lighting System and Controls* will be met. See Design Analysis – 2.8 Electrical.
   - Moisture Controls
     - The finished roof surface shall be replaced with elastomeric sheet waterproofing or fluid applied water proofing with solar reflective top coating. No additional information provided in the design analysis regarding additional moisture control layers.
   - Reduce Volatile Organic Compounds (VOCs)
     - The requirements listed in Table 3-1 of *UFGS 01 33 29 Sustainability Requirements and Reporting* will be met. Submittal documentation, certifications, or labels demonstrating compliance with the cited requirements will be provided by GC prior to construction.

- Biologically-Based Products
  - The requirements per Section 9002 of the Farm Security and Rural Investment Act will be met. Products composed of the highest percentage of biobased content consistent with the USDA Bio-preferred Program will be specified. Submittal documentation, certifications, or labels demonstrating compliance with the cited requirements will be provided by GC prior to construction.
- Ozone Depleting Substances
  - Ozone depleting substances to not be used on the project and EPAs Significant New Alternatives Policy (SNAP) program will be implemented to identify acceptable substitutes or where other environmentally preferable products are available.
- Storage and Collection of Recyclables
  - Location of storage and collection of recyclables will be in the trash storage rooms on Floor 1.
- Waste Diversion
  - A minimum of 60% of nonhazardous construction and demolition water material will be diverted from landfills. GC will provide appropriate documentation to demonstrate compliance if being pursued.
- Address Climate Change Risk
  - No climate change risk factors identified. Project is not in a flood zone.

2. Name and contact information for: Contractor's Point of Contact (POC) to ensure sustainability goals are accomplished and documentation is assembled. Contact to be provided by GC prior to construction.

3. Indoor Air Quality Plan
   - GC to provide indoor air quality plan and include in eNotebook.

## C. Energy Model and LCCA Calculations

All calculations required to demonstrate compliance with the HPSB Guiding Principles Requirements are documented below.

| | |
|---|---|
| **Project Name:** | Repair Courtney Tower, 4511, Kadena Air Base |
| **Project #:** | CHI-22022320-A0 |
| **Document Description** | Energy Model Results - 65% Design |
| **Conditioned Building Area (gsf)** | 145,772 |
| **Electricity Rates ($/kWh)** | 0.138 |
| **Gas Rates ($/therm)** | 2 |

| Model Type | Input Descriptions | Electricity Use (kWh) | Natural Gas Use (therms) | Total Utility Cost ($) | % Cost Savings ASHRAE 90.1 2013 Appendix G | UFC Percentage Improvement in Energy Consumption (without Receptacle)* | Initial Cost ($) | Life Cycle Cost ($) | LCCE |
|---|---|---|---|---|---|---|---|---|---|
| **Base Case** | ASHRAE 90.1-2013 App G:<br>Climate Zone 2A - Envelope - Appendix G<br>Interior Lighting: Per 90.1-2013 App G.<br>Baseline - System 1 - Packaged Terminal Air Conditioner (9.5 EER, 2.92 COP) | 1,523,713.00 | 92,762.00 | $ 395,796.39 | - | - | $ 5,830,880.00 | $ 17,913,929.00 | n/a |
| **Proposed** | Envelope:<br>Roof Assembly - U-0.369<br>Wall Assembly - U-0.552<br>Windows - Metal Frame - U-0.60, SHGC-0.23, VT-0.50 / 18% WWR<br>Interior Lighting - 0.65 W/sf<br>HVAC:<br>Mini-split Heat Pumps (18.0 SEER/ 9.5 HSPF)<br>Dedicated Outside Air System (14.0 SEER/ 3.41 HSPF) | 2,619,640.00 | 0.00 | $ 361,510.32 | 8.7% | 40.5% | $ 9,038,720.00 | $ 17,659,726.00 | Y |
| **ECM1** | HVAC:<br>Rotary Screw Chiller (1.17 kW/ton)<br>FCUs (Cooling Only) w/ Electric Baseboard Heating | 2,792,542.00 | 0.00 | $ 385,370.80 | 2.6% | 36.2% | $ 13,203,080.00 | $ 22,872,566.00 | N |
| **ECM2** | HVAC:<br>Packaged Terminal Air Conditioner (10.0 EER, 3.0 COP) | 2,913,236.00 | 0.00 | $ 402,026.57 | -1.6% | 33.2% | $ 7,288,600.00 | $ 19,473,951.00 | N |

# LEED COMPLIANCE SUMMARY (Part 1 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* Proposed | *5/30/2023* |

## GENERAL INFORMATION

| | | | |
|---|---|---|---|
| Simulation Program: | *EnergyPro* | Weather File: | *TWN_Taipei.466960_IWEC.bin* |
| Principal Heating Source: | *Electric (No Natural Gas Availab* | Climate Zone: | *DOE Climate Zone 2A* |
| Energy Code Used: | *ASHRAE 90.1-2013* | Latitude: | *25* |
| New Construction Percent: | *100* | Longitude: | *122* |

**List the ASHRAE addenda used in the modeling assumptions for EAc1:**

## SPACE SUMMARY

| Space Name / Description | Space Usage Type | Space Size | Regularly Occupied GSF | Unconditioned GSF | Operating Hours (per week) |
|---|---|---|---|---|---|
| *Floor 1* | *Guest Room* | *27411* | *27411* | | *168* |
| *Floor 2* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 3* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 4* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 5* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 6* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 7* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 8* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 9* | *Guest Room* | *14795* | *14795* | | *168* |
| *Undefined Zone* | *Guest Room* | *1* | *1* | | *168* |
| **TOTAL:** | | *145,772* | *145,772* | *0* | |

# LEED COMPLIANCE SUMMARY (Part 2 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## ENERGY TYPE SUMMARY

| Energy Type | Utility Rate Description | Baseline Virtual Rate ($ per unit energy) | Proposed Virtual Rate ($ per unit energy) | Units of Energy | Units of Demand |
|---|---|---|---|---|---|
| Electricity | | | | kWh | kW |
| Natural Gas | | | | therms | MBH |
| | | | | | |
| | | | | | |

## RENEWABLE ENERGY SOURCE SUMMARY

| Renewable Source | Backup Energy Type | Annual Energy Generated | Rated Capacity | Renewable Energy Cost |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
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| | | | | |

## EXCEPTIONAL CALCULATION MEASURE SHORT DESCRIPTION

| Energy Type(s) | Annual Energy Savings by Energy Type | Annual Cost Savings | Exceptional Calculation Measure Narrative: |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# LEED COMPLIANCE SUMMARY (Part 3 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## BASELINE PERFORMANCE – PERFORMANCE RATING METHOD COMPLIANCE

| End Use | Process? | Baseline Design Energy Type | Units of Annual Energy & Peak Demand | Baseline (0 deg rotation) | Baseline (90 deg rotation) | Baseline (180 deg rotation) | Baseline (270 deg rotation) |
|---|---|---|---|---|---|---|---|
| *Interior Lighting* | ☐ | *Electricity* | *kWh* | *435764* | *435764* | *435764* | *435764* |
| | | | *kW* | *119.4* | *119.4* | *119.4* | *119.4* |
| *Exterior Lighting* | ☐ | *Electricity* | *kWh* | *3285* | *3285* | *3285* | *3285* |
| | | | *kW* | *0.8* | *0.8* | *0.8* | *0.8* |
| *Space Heating* | ☐ | *Electricity* | *kWh* | *12693* | *12669* | *12650* | *12670* |
| | | | *kW* | *45.6* | *45.7* | *45.5* | *45.7* |
| *Space Cooling* | ☐ | *Electricity* | *kWh* | *531800* | *529529* | *532207* | *529278* |
| | | | *kW* | *232.3* | *230.8* | *232.2* | *231.6* |
| *Pumps* | ☐ | *Electricity* | *kWh* | *19* | *19* | *19* | *19* |
| | | | *kW* | *0.5* | *0.5* | *0.5* | *0.5* |
| *Fans-Interior* | ☐ | *Electricity* | *kWh* | *303644* | *300038* | *303644* | *300038* |
| | | | *kW* | *34.7* | *34.3* | *34.7* | *34.3* |
| *Service Hot Water* | ☐ | *NaturalGas* | *therms* | *92762* | *92762* | *92762* | *92762* |
| | | | *kBtu/hr* | *2725.2* | *2725.2* | *2725.2* | *2725.2* |
| *Service Hot Water* | ☐ | *Electricity* | *kWh* | *0* | *0* | *0* | *0* |
| | | | *kW* | *0.0* | *0.0* | *0.0* | *0.0* |
| *Receptacle Equipment* | ☑ | *Electricity* | *kWh* | *239431* | *239431* | *239431* | *239431* |
| | | | *kW* | *65.6* | *65.6* | *65.6* | *65.6* |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |

## BASELINE ENERGY COSTS

| Energy Type | Baseline Cost (0 deg rotation) | Baseline Cost (90 deg rotation) | Baseline Cost (180 deg rotation) | Baseline Cost (270 deg rotation) | Baseline Building Performance |
|---|---|---|---|---|---|
| *Electricity* | *0* | *0* | *0* | *0* | *0* |
| *NaturalGas* | *0* | *0* | *0* | *0* | *0* |
| Total Baseline Costs: | *0* | *0* | *0* | *0* | *0* |

# LEED COMPLIANCE SUMMARY (Part 4 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## PERFORMANCE RATING TABLE – PERFORMANCE RATING METHOD COMPLIANCE

| End Use | Process? | Proposed Design Energy Type | Baseline Building Results | Proposed Design Units | Proposed Building Results | Percentage Savings |
|---|---|---|---|---|---|---|
| *Interior Lighting* | ☐ | *Electricity* | *435764* | *kWh* | *311261* | *28.6%* |
| | | | *119.4* | *kW* | *85.3* | *28.6%* |
| *Exterior Lighting* | ☐ | *Electricity* | *3285* | *kWh* | *2628* | *20.0%* |
| | | | *0.8* | *kW* | *0.6* | *20.0%* |
| *Space Heating* | ☐ | *Electricity* | *12670* | *kWh* | *29914* | *-136.1%* |
| | | | *45.6* | *kW* | *31.8* | *30.3%* |
| *Space Cooling* | ☐ | *Electricity* | *530704* | *kWh* | *192283* | *63.8%* |
| | | | *231.7* | *kW* | *132.4* | *42.9%* |
| *Pumps* | ☐ | *Electricity* | *19* | *kWh* | *4* | *77.8%* |
| | | | *0.5* | *kW* | *0.1* | *80.0%* |
| *Fans-Interior* | ☐ | *Electricity* | *301841* | *kWh* | *239148* | *20.8%* |
| | | | *34.5* | *kW* | *27.3* | *20.8%* |
| *Service Hot Water* | ☐ | *NaturalGas* | *92762* | *therms* | *0* | *100.0%* |
| | | | *2725.2* | *kBtu/hr* | *0.0* | *100.0%* |
| *Service Hot Water* | ☐ | *Electricity* | *0* | *kWh* | *1604972* | *0.0%* |
| | | | *0.0* | *kW* | *488.6* | *0.0%* |
| *Receptacle Equipment* | ☑ | *Electricity* | *239431* | *kWh* | *239431* | *0.0%* |
| | | | *65.6* | *kW* | *65.6* | *0.0%* |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |

## ENERGY COST AND CONSUMPTION BY ENERGY TYPE

| | Baseline Design | | | Proposed Design | | | Percent Savings | |
|---|---|---|---|---|---|---|---|---|
| Energy Type | Energy Use | | Cost | Energy Use | | Cost | Energy Use | Cost |
| *Electricity* | *1,523,713* | kWh | *0* | *2,619,640* | kWh | *0* | *-71.9%* | *0.0%* |
| *NaturalGas* | *92,762* | therms | *0* | *0* | therms | *0* | *100.0%* | *0.0%* |
| Subtotal (Model Outputs): | *14,476,648* | (kBtu/year) | *$0* | *8,940,830* | (kBtu/year) | *$0* | *38.2%* | *0.0%* |

## Table 1.4.1 - Opaque Building Envelope

***Instructions:*** *Complete the Opaque Building Envelope Requirements section, then de scribe each unique opaque building envelope construction on a separate row in the Opaque Building Envelope Constructions table (required inputs are green). Note that extra rows can be added using the button to the lower left of each construction type as necessary. An example of the expected level of detail has been provided for each type of construction. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". Baseline Case Information will autogenerate for New Construction Opaque Assemblies when the space conditioning category is selected.*

### Opaque Building Envelope Requirements

For projects modeled using ASHRAE 90.1-2007 Appendix G, select the climate zone: DOE Climate Zone 2A

| | | |
|---|---|---|
| Select the appropriate description for the project: | | ☑ The project is 100% new Construction<br>☐ The project is 100% existing renovation<br>☐ The project is a Cobination of new construction and existing renovation |
| | For existing spaces, have there been any changes to the space conditioning category (for example, previously unconditioned spaces becoming fully conditioned)? | ☑ No Changes to space conditioning categories<br>☐ Yes, and the associated constructions in the Baseline case have been modeled using the Appendix G requirements for new |
| Check the applicable space conditioning categories included in the project: | | ☐ Nonresidential ☑ Residential ☐ Semiheated ☐ Unconditioned |
| | All spaces qualifying as semiheated are not defined as heated per Table 3.1 or indirectly conditioned (see Section 3.2 definition of ***space*** ) | ☐ Yes ☑ N/A (no semiheated spaces) |
| | Opaque envelope assemblies separating conditioned space from unconditioned or semiheated space are modeled using semiheated envelope assemblies per the *ASHRAE 90.1-2007 User's Manual* , Section 5.1.1, *Envelope Component Assemblies* (Page 5-2). | ☑ Yes ☐ N/A (no opaque assemblies separating conditioned and semiheated / unconditioned space) |

| | |
|---|---|
| All ***Baseline new construction opaque envelope assemblies*** were modeled as required by Table 5.5 for the project's climate zone and Table G3.1#5(b) as delayed assemblies. See the Helpful Notes for each opaque assembly for more information. | Yes |
| All ***Proposed*** roofs, above-grade exterior walls, below-grade exterior walls, exposed floors, slab-on-grade floors, and opaque doors were modeled as-designed and with assembly U-factors / C-factors / F-factors consistent with Appendix A values | Yes |
| Infiltration rates and schedules have been modeled identically in the Baseline and Proposed case | Yes |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s) that apply, or the circumstances preventing the opaque envelope parameters from being modeled as required. If the energy simulation software is not capable of modeling the required parameters, describe the adjustments that were made to provide a thermodynamically similar representation or provide a narrative justifying why the predicted energy performance results will not be influenced:***

**Opaque Building Envelope Constructions**

| Model Input Parameter | New / Existing | Space-Conditioning Category | Baseline Case | | Proposed Case | | Baseline Roof Reflectivity Modeled as 0.3? | Proposed Roof Reflectivity Modeled |
|---|---|---|---|---|---|---|---|---|
| | | | Description | Assembly U-factor/ C-factor/ F-factor | Description | Assembly U-factor/ C-factor/ F-factor | | |
| Roof Constructions | Helpful Notes: | | •New roofs: insulation entirely above deck with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing roofs: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | 0.3 per Table G3.1#5(e) | 0.3 or 0.45 per Table G3.1#5(c) |
| | New | Cond | New | 0.039 | Concrete Deck Roof | 0.369 | 0.55 | 0.10 |
| | | | | | | | | |
| Above-Grade Exterior Wall Constructions | Helpful Notes: | | •New above-grade walls: steel-framed with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing above-grade walls: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | New | Cond | New | 0.064 | 6" Concrete Wall | 0.552 | | |
| | | | | | | | | |
| Below-Grade Exterior Wall Constructions | Helpful Notes: | | •New below-grade walls: 8" medium weight concrete block with solid grouted cores as defined in A4.1 with C-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing below-grade walls: existing conditions per Table G3.1#5(f). | | Proposed construction assembly C-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | | | | | | | | |
| | | | | | | | | |
| Exposed Floor Constructions | Helpful Notes: | | •New floors: steel-joist with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing floors: existing conditions per Table G3.1#5(f).<br>•For floor assemblies above unconditioned or semiheated space, select the space conditioning category as semiheated per 90.1-2007 User's Manual, Section 5.1.1-Envelope Component Types (Figure 5-C) | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | | | | | | | | |
| | | | | | | | | |
| Slab-On-Grade Floors | Helpful Notes: | | •New slab-on-grade floors: unheated 6" concrete slab with F-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing slab-on-grade floors: existing conditions per Table G3.1#5(f). | | Proposed construction assembly F-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | New | Cond | New | 0.654 | Slab On Grade | 0.654 | | |
| | | | | | | | | |
| Opaque Doors | Helpful Notes: | | •New opaque doors: U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing opaque doors: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with A7.1 of ASHRAE 90.1 for unlabeled doors | | | |
| | New | Cond | New | 0.500 | Metal Door | 0.700 | | |
| | | | | | | | | |

**Additional notes:**

## Table 1.4.2A - Shading & Orientation

***Instructions:*** *Provide the following shading and orientation information (required inputs are green). An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

| Model Input Parameter | | Baseline Case | | | Proposed Case | | |
|---|---|---|---|---|---|---|---|
| Helpful Notes: | | •All vertical glazing flush with exterior wall and no shading projections per Table G3.1#5(c)<br>•No manual shading devices such as blinds or shades per Table G3.1#5(c)<br>•No self-shading per Table G3.1#5<br>•Total vertical fenestration areas for new construction equal to Proposed up to 40% maximum, and distributed on each face of the building in the same proportions as the Proposed design per Table G3.1#5(c)<br>•Total skylight area for new construction equal to Proposed up to 5% maximum per Table G3.1#5(d) | | | •No manual shading devices such as blinds or shades per Table G3.1#5(d)<br>•Permanent shading devices (such as fins, overhangs, and light shelves) and automatically controlled shades or blinds may be modeled per Table G3.1#5(d)<br>•Shading by adjacent structures and terrain may be modeled, but must be modeled identically in the Baseline case | | |
| Shading Devices | | ☑ No shading projections, manual shading devices, or self-shading have been modeled for the Baseline building<br>☐ Any shading by adjacent structures and terrain has been modeled identically to the Proposed case (if applicable) | | | | | |
| Building Shape & Orientation | | ☑ The Baseline building is modeled with the same shape and orientation as the Proposed building, and for new construction rotated 90°, 180°, and 270° | | | | | |
| Above-Grade Wall & Vertical Glazing Area by Orientation | Orientation | Above Grade Wall Area ($ft^2$) | Vertical Glazing Area | | Above Grade Wall Area ($ft^2$) | Vertical Glazing Area | |
| | | | ($ft^2$) | (%) | | ($ft^2$) | (%) |
| | North | 16,191 | 2,412 | 15% | 16,191 | 2,412 | 15% |
| | East | 14,605 | 3,204 | 22% | 14,605 | 3,204 | 22% |
| | South | 16,187 | 2,412 | 15% | 16,187 | 2,412 | 15% |
| | West | 14,605 | 3,204 | 22% | 14,605 | 3,204 | 22% |
| | **Total** | 61,588 | 11,232 | 18% | 61,588 | 11,232 | 18% |
| Roof & Skylight Area | | Roof Area ($ft^2$) | Skylight Area | | Roof Area ($ft^2$) | Skylight Area | |
| | | | ($ft^2$) | (%) | | ($ft^2$) | (%) |
| | | 27,412 | 0 | 0% | 27,412 | 0 | 0% |

## Table 1.4.2B - Fenestration

***Instructions:*** *Describe each unique fenestration assembly on a separate row in the following table (required inputs are green). Note that additional rows can be expanded using the Add a Line button to the lower left of each fenestration type as necessary. An example of the expected level of detail has been provided for each type of fenestration. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". Baseline Case Information will autogenerate for New Construction Nonresidential or Residential Vertical Glazing and for New Construction Nonresidential skylights when the Baseline Description is selected from one of the items listed.*

| Model Input Parameter | New / Existing | Space Conditioning Category | Baseline Case | | | Proposed Case | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Description | Assembly U-factor | SHGC | Description | Assembly U-factor | SHGC | VLT |
| Vertical Glazing | Helpful Notes: | | •New vertical glazing: assembly U-factor and SHGC from appropriate Table 5.5 per Table G3.1#5(c).<br>•Existing vertical glazing: existing conditions per Table G3.1#5(f). | | | Proposed vertical glazing assembly U-factor should be as-designed and account for the impact of the frames on the whole assembly. Reference Table A8.2 of ASHRAE 90.1 as necessary. | | | |
| | New | Cond | Standard | 0.60 | 0.25 | Proposed Windows | 0.60 | 0.23 | 0.50 |
| | | | | | | | | | |
| Skylights | Helpful Notes: | | •New skylights: assembly U-factor and SHGC from appropriate Table 5.5 per Table G3.1#5(d).<br>•Existing skylights: existing conditions per Table G3.1#5(f). | | | Proposed skylight assembly U-factor should be as-designed and account for the impact of the frames on the whole assembly. Reference Tables A8.1A and A8.1B of ASHRAE 90.1 as necessary. | | | |
| | | | | | | | | | |
| | | | | | | | | | |

How were the Proposed case framed assembly fenestration U-factors determined? NFRC Rated

**Additional notes:**

## Table 1.4.3A - Interior Lighting

***Instructions:*** *Confirm that the energy model complies with the Interior lighting requirements listed, and provide a narrative explaining any discrepancies. Select the interior lighting categorization procedure, and then complete the corresponding lighting table (required inputs are green). An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". For projects using California Title-24, the following Title-24 lighting compliance forms may be uploaded in lieu of this sheet (2008 - LTG-1C, LTG-2C, LTG-3C, LTG-5-C, OLTG-1C, OLTG-2C, SLTG-1C; 2005 - LTG-1C, LTG-2-C, LTG-3-C, LTG-4-C, LTG-5-C, LTG-9-C, OLTG-1-C, OLTG-2-C, OLTG-3-C, OLTG-4-C).*

### Interior Lighting Requirements

| | |
|---|---|
| All lighting schedules have been modeled identically in the Baseline and Proposed case and reflect the anticipated operating schedules of each space | ☑ Yes ☐ No |
| The Proposed lighting power includes all lighting system components shown or provided for on the plans (including lamps and ballasts and task and furniture-mounted fixtures except where specifically exempted) | ☑ Yes ☐ No |
| Per ASHRAE 90.1-2007, Section 9.1.4 (c), and (d):<br>For all **line-voltage lighting track and plug-in busway**, designed to allow the addition and/or relocation of luminaires without altering the wiring of the system, the proposed case wattage is modeled as:<br>(a) the specified wattage of the luminaires included in the sytem with a minimum of 30 W/lin ft, OR<br>(b) the wattage limit of the system's circuit breaker, OR<br>(c) the wattage limit of other permanent current-limiting device(s)<br>For all **low-voltage lighting track, cable conductor, rail conductor,** and other flexible lighting systems that allow the addition and/or relocation of luminaires without altering the wiring of the system, the proposed case wattage is modeled as the wattage of the transformer supplying the | ☐ Yes<br>☐ No<br>☑ N/A |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s) that apply, or the circumstances preventing the lighting parameters from being modeled as required. If the energy simulation software is not capable of modeling the required parameters, describe the adjustments that were made to provide a similar representation or provide a narrative justifying why the predicted energy performance results will not be influenced:***

### Categorization Procedure

| | |
|---|---|
| Select the categorization procedure (Building Area or Space by Space Method) used to determine the lighting power density (LPD) in the Proposed and Baseline case | ☑ Building Area Method<br>☐ Space by Space Method |

### Building Area Method

| Table 9.5.1 Building Area Type | Total Area of Building Type ($ft^2$) | Baseline Case | Proposed Case | | | | |
|---|---|---|---|---|---|---|---|
| | | Modeled LPD ($W/ft^2$) | Design LPD ($W/ft^2$) | Automatic Lighting Controls and Space Types | Table G3.2 Power Adjust-ment | Modeled LPD ($W/ft^2$) | Daylighting Controls |
| Helpful Notes:<br>Parking garages are always considered a separate building area type, and if present in the building, must be listed as a separate building area type from the main building area type | | Modeled using the maximum allowance from Table 9.5.1 ***(values provided for reference - overwrite if modeled differently)*** | •Lighting power should be modeled as designed (or installed) including all lighting system components (lamps and ballasts)<br>•Credit for automatic lighting controls should be modeled using the appropriate power adjustment from Table G3.2, applied only to the controlled lighting power and not where required by 9.4.1.2 per Table G3.1#6(g) [conference rooms; meeting rooms; employee lunch and break rooms; classrooms excepting Pre-K through 12th grade, laboratory, or shop]<br>•Automatic daylighting controls must either be modeled directly in the simulation, or modeled using schedule adjustments determined by a separate daylighting analysis per Table G3.1#6(f) | | | | |
| Guest Room | 145,772 | 0.910 | 0.650 | | 0.000 | 0.650 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| ***Total*** | 145,772 | 0.910 | 0.650 | | | 0.650 | |

### Interior Process Lighting (if applicable)

| Description | Section 9.2.2.3 Exemption | Total Process Lighting Power (Watts) | Modeled Identically In Baseline? |
|---|---|---|---|
| Helpful Notes: | Any lighting not regulated by ASHRAE 90.1 is considered process and must be modeled identically in the Proposed and Baseline case unless an Exceptional Calculation is submitted | | |
| Process Lighting | | 0 | ☑ Yes ☐ No |

## Table 1.4.4 - Process Equipment

***Instructions:*** *Select the method used to model receptacle equipment, and then complete the corresponding receptacle equipment table (required inputs are green). Other process equipment should be reported in the bottom table. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Process Equipment Requirements

| | |
|---|---|
| All receptacle equipment and other process equipment designed or anticipated for the building have been accounted for in the energy models. | ☑ Yes ☐ No |
| If process energy accounts for less than 25% of the total Baseline energy cost, an additional narrative justification for the low process cost has been provided in the supporting documentation. ***Note: process energy should not be arbitrarily set to 25% of the total Baseline cost, but should reflect the actual process loads anticipated for the building.*** | ☑ Yes ☐ No ☐ N/A(>25%) |

***If any of the process equipment requirements are indicated as "No" above, the project does not likely comply with LEED modeling requirements. It is recommended that the project team pursue a "Credit Interpretation Ruling" to justify the modeling approach. Please also provide any further information below to justify the modeling approach used.***

### Receptacle Equipment Modeling Method

Indicate whether the receptacle equipment was modeled using an average equipment power density for the building, equipment power densities by space type, or by entering the power associated with specific devices in each space (may select more than one)

- ☐ Building Average Equipment Power Density (W/sq.ft.)
- ☑ Space by Space Equipment Power Density (W/sq.ft.)
- ☐ Equipment Power by Device (Watts)

### Space by Space Equipment Power Densities

| Space Type | Total Area of Space Type | Equipment Power Density ($W/ft^2$) | Equipment Included in Power Density | Baseline Modeled Identically? |
|---|---|---|---|---|
| Helpful Notes: | •All receptacle loads must be modeled identically between the Proposed and Baseline case and included in the simulations per Table G3.1#12<br>•Any credit for improved receptacle equipment must be submitted using the Exceptional Calculation Method | | | |
| Guest Room | 145,772 | 0.500 | | Yes |
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| | | | | |
| ***Total*** | 145,772 | 0.500 | ***Total Power Modeled Using Space-by-Space Method (kW):*** | 72.9 |

### Other Process Equipment

| Equipment Type (Change/Add Labels as Necessary) | Energy Source | Energy Demand (kW) | Modeling Parameters | Baseline Modeled Identically? |
|---|---|---|---|---|
| Helpful Notes: | •All process loads must be modeled identically between the Proposed and Baseline case and included in the simulations per Table G3.1#12<br>•Any credit for improved process equipment must be submitted using the Exceptional Calculation Method<br>•Exception: When the process or receptacle equipment includes components regulated by minimum efficiency requirements in ASHRAE 90.1, these components may be modeled in the Baseline Case using the minimum ASHRAE 90.1 efficiencies, and in the proposed case using actual proposed case efficiencies (e.g. Baseline may be modeled using furnace efficiencies from Table 6.8.1E, boiler efficiencies from Table 6.8.1G, chiller efficiencies from Table 6.8.1C or Section 6.4.1.2, or motor efficiency from Section 10.4). | | | |
| Elevators/Escalators | | | | |
| Refrigeration Equipment | | | | |
| Kitchen Equipment | | | | |
| Data Center Equipment | | | | |
| Process Loads | elec | 0.0 | | Yes |
| ***Total*** | | | ***Total Power for Other Process Equipment (kW):*** | |
| | | | ***Total Power for Building Process/Receptacle Equipment(kW):*** | |

## Table 1.4.5 - Service Water Heating

***Instructions:*** *Complete the Service Water Heaters table for each unique type of system in the project (required inputs are green). Use the Add a System Type button for more than one type of system. Complete the Service Hot Water Fixtures table if credit is modeled for low-flow fixtures in the Proposed case. If the project includes service hot water circulation pumps, complete the Service Hot Water Pumps table. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Service Water Heaters

| Model Input Parameter | Baseline Case | Proposed Case |
|---|---|---|
| Helpful Notes: | •New systems: minimum performance requirements from Table 7.8 per Table G3.1#11(b)<br>•Existing systems: actual system inputs per Table G3.1#11(a)<br>•Model separate service water heating system when design uses combined system with space heating per Table G3.1#11(e)<br>•Condenser heat recovery as required by 6.5.6.2 per Table G3.1#11(f) | •Service water heaters modeled as designed (or installed) per Table G3.1#11(a&b)<br>•Where no service hot water system exists or has been specified but the building will have service hot water loads, a service hot water system should be modeled identical to the Baseline per Table G3.1#11(c)<br>•For buildings with no service hot water loads, no service hot water system should be modeled per Table G3.1#11(d) |
| System Type & Fuel | Gas Fired | Electric Res |
| Input Rating (kW, MBH, etc.) | 15,359 Btu/hr | 15,359 Btu/hr |
| Efficiency (EF, SL, %, etc.) | 0.600 Energy Factor | 0.980 Energy Factor |
| Storage Volume (gal) | 50.0 gallons | 50.0 gallons |
| Storage Temperature (°F) | 140 F | 140 F |
| Peak Hot Water Demand (gpm) | 58.332 | 58.332 |
| Condenser heat recovery | None | None |

### Service Hot Water Fixtures

***Note:*** *This table is only required to be completed if credit is modeled in the Proposed case for low-flow fixtures*

| Fixture Type | Fixture Outlet Temp (°F) | % Hot Water | Baseline Case | | | Proposed Case | | |
|---|---|---|---|---|---|---|---|---|
| | | | Flow Rate (gpm or gpc) | WEp1 Annual Total Water Consumption (kgal) | Annual Hot Water Consumption (kgal) | Flow Rate (gpm or gpc) | WEp1 Annual Total Water Consumption (kgal) | Annual Hot Water Consumption (kgal) |
| Helpful Notes: | •Refer to Table 3 in Chapter 50 of 2011 ASHRAE Handbook-HVAC Applications for fixture outlet temps used to determine % hot water<br>•% Hot water should account for the DHW supply-to-fixture delta T, and for the percentage hot water versus cold water usage (e.g. residential lavatories would be expected to have cold water usage associated with brushing teeth) | | •Fixtures included in the WEp1 calculations: values must be consistent with the WEp1 form<br>•Additional fixtures not included in WEp1: use Proposed values or provide supporting documentation for Baseline assumption (example: Energy Star documentation of average hot water usage for residential dishwasher or clothes washer) | | | Values should be consistent with the design (or installed) fixtures and WEp1 (if applicable) | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| ***Total*** | | | | | | | | |
| | | | Annual Equivalent Full Load Hours of DHW Operation | | | Annual Equivalent Full Load Hours of DHW Operation | | |
| | | | Calculated Peak Hourly Flow (gal/hour) | | | Calculated Peak Hourly Flow (gal/hour) | | |

### Service Hot Water Pumps

| Model Input Parameter | Baseline Case | Proposed Case |
|---|---|---|
| Helpful Notes: | •Service hot water pumps should be modeled identically between the Proposed and Baseline case<br>•Any credit for improved service hot water pumps must be submitted using the Exceptional Calculation Method | Service hot water pumps modeled as designed (or installed) |
| Number of Pumps | | |
| Total Pump Power (kW) | | |
| Type of Pump (Constant/Variable) | | |
| Pump Control | | |

**Additional notes:**

## Table 1.4.6 - General HVAC

***Instructions:*** *Complete the Special Circumstances section, the Proposed and Baseline HVAC System Type(s) tables, and the HVAC Modeling Requirements checklist below. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Special Circumstances

| | Yes | No |
|---|---|---|
| Is the project building connected to a district or campus thermal energy system where thermal energy is produced for or distributed to multiple buildings? | ☐ | ☐ |

| | |
|---|---|
| The district energy system includes (check all that apply): | ☐ District Cooling ☐ District Heating ☐ CHP |
| Select how the district energy system has been modeled:<br>*Note: "DES v2" refers to the document "Treatment of District or Campus Thermal Energy in LEED V2 and LEED 2009 – Design & Construction" dated August 10, 2010, which can be accessed at http://www.usgbc.org/ShowFile.aspx?DocumentID=7671* | ☐ ASHRAE 90.1-2007 Appendix G without Addenda<br>☐ ASHRAE 90.1-2007 Appendix G Addenda ai<br>☐ California Title-24 Baseline default efficiencies<br>☐ DES v2 Option 1 (Building Stand-Aone)<br>☐ DES v2 Option 2 (Aggregate Building/DES) |
| For DES v2 Option 2, identify the method for evaluating the district plant average efficiency. | ☐ Modeling Method ☐ Monitoring Method |

| | |
|---|---|
| Please indicate all relevant equipment located on the project site: | ☐ Chillers ☐ Cooling Towers / Fluid Coolers ☐ Boilers for Space Heating / Backup Heat<br>☐ Ground Source / Geothermal Heat Pump ☐ Combined Heat & Power (CHP) |

| | Yes | No |
|---|---|---|
| Does the project building include tenant or other unfinished spaces whose systems (HVAC, lighting, etc.) are not included in the project's scope of work? | ☐ | ☐ |

| | |
|---|---|
| Select how the unfinished spaces have been modeled: | ☐ All equipment in the unfinished spaces not included in the project scope of work has been modeled identically in the Baseline and Proposed case using the Baseline modeling requirements.<br>☐ Credit has been modeled in the Proposed case for energy efficiency measures that are specifically identified in signed tenant sales and lease agreements (LEED Core & Shell only. New Construction must be modeled |

### Proposed HVAC System Type(s)

| System Description | Spaces Modeled |
|---|---|
| Helpful Notes: •The HVAC system type and all related parameters, such as equipment capacities and efficiencies, must be modeled as designed (or installed) per Table G3.1#10(a&b)<br>•Where no heating system exists or has been designed, the classification is assumed to be electric and the heating system is modeled identically to the Baseline case per Table G3.1#10(c)<br>•Where no cooling system exists or has been designed, the cooling system is modeled identically to the Baseline case per Table G3.1#10(d) | |
| Mini-Split Heat Pumps | Floor 1 |
| | Floor 2 |
| | Floor 3 |
| | Floor 4 |
| | Floor 5 |
| | Floor 6 |
| | Floor 7 |
| | Floor 8 |
| | Floor 9 |
| DOAS-1 | Undefined Zone |
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**Baseline HVAC System Type(s)**

| Model Input Parameter | Table G3.1.1A System Type (or Semiconditioned System Description) | G3.1.1 Exception (or Semiconditioned Capacity and Area) | Spaces Modeled |
|---|---|---|---|
| Helpful Notes: | •Refer to Section G3.1.1 and Table G3.1.1A (including footnotes) for Primary HVAC System selection | | |
| Primary HVAC System | - Room PTAC | | Floor 1 |
| Primary HVAC System | - Room PTAC | | Floor 2 |
| Primary HVAC System | - Room PTAC | | Floor 3 |
| Primary HVAC System | - Room PTAC | | Floor 4 |
| Primary HVAC System | - Room PTAC | | Floor 5 |
| Primary HVAC System | - Room PTAC | | Floor 6 |
| Primary HVAC System | - Room PTAC | | Floor 7 |
| Primary HVAC System | - Room PTAC | | Floor 8 |
| Primary HVAC System | - Room PTAC | | Floor 9 |
| Primary HVAC System | - Room PTAC | | Undefined Zone |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
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| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Other HVAC System(s) | - | | |
| | - | | |

**HVAC Modeling Requirements**

***Instructions:*** *After completing the information above, click "Refresh Modeling Requirements" to the left. All Proposed and Baseline HVAC system types must be entered above to to generate the correct modeling requirements below. After clicking "Refresh Modeling Requirements", identify each item as "Yes" or "No", and provide a further description for any items marked as "No".*

| | | |
|---|---|---|
| **Proposed HVAC Requirements** | All ***Proposed*** HVAC systems and related parameters, such as equipment capacities, efficiencies, airflows, fans, etc. have been modeled as designed and are consistent with supporting documentation uploaded in LEED Online | Yes |
| | Each ***Proposed*** HVAC thermal zone has been modeled as a separate thermal block except as allowed by Table G3.1#7 | Yes |
| | All ***Proposed*** HVAC systems serving conditioned spaces have been modeled with heating and cooling as required by Table G3.1#1(b), with heating and/or cooling added as necessary identically to the Baseline case per Table G3.1#10(c&d) except where System types (9) or (10) have been modeled in accordance with Addendum dn | Yes |
| | All ***Proposed*** HVAC systems and related parameters can be modeled directly in the energy simulation program used | Yes |
| | All ***Proposed*** fan part-load efficiency curves for variable volume fans have been modeled identically to the Baseline curves for variable volume fans (if not, provide a description of the fan curves used in the space at the bottom of this table, and confirm that the proposed case curves are representative of the actual building design) | Yes |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s)***

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-0 | | Standard System-1 | | Standard System-2 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 1,137 | kBtu/h | 373 | kBtu/h | 373 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 550 | kBtu/h | 99 | kBtu/h | 99 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 13,402 | cfm | 7,599 | cfm | 7,599 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 16,000 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | •50% energy recovery effectiveness<br>•Bypass or control to permit economizer | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm | 4.02 | kW | 2.28 | kW | 2.28 | kW | |
| Return/Relief Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| Exhaust Fan Power | | 12.03 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 16.05 | kW | 2.28 | kW | 2.28 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 16.05 | kW | 2.28 | kW | 2.28 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-3 | | Standard System-4 | | Standard System-5 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 373 | kBtu/h | 373 | kBtu/h | 373 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 99 | kBtu/h | 99 | kBtu/h | 99 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 7,599 | cfm | 7,599 | cfm | 7,599 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 2,219 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| Exhaust Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-6 | | Standard System-7 | | Standard System-8 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 373 | kBtu/h | 373 | kBtu/h | 422 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 99 | kBtu/h | 99 | kBtu/h | 116 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 7,599 | cfm | 7,599 | cfm | 8,916 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 2,219 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| Exhaust Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | | | | | |
| System Designation(s) | Consistent with designations used in model | Standard System-9 | | | | | | |
| Number of Similar Systems | | 1 | | | | | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 0 | kBtu/h | | kBtu/h | | kBtu/h | 4,170 |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 11.9 EER | | | | | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | | | | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 0 | kBtu/h | | kBtu/h | | kBtu/h | 1,358 |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 3.34 COP | | | | | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | | | | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 20 | cfm | | cfm | | cfm | 75,530 |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 0 | cfm | | cfm | | cfm | 33,754 |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | | | | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | | °F | | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | | | | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply | None | | | | | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | •50% energy recovery effectiveness<br>•Bypass or control to permit economizer | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm | 0.00 | kW | | kW | | kW | |
| Return/Relief Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.00 | kW | | kW | | kW | |
| Exhaust Fan Power | | 0.00 | kW | | kW | | kW | |
| System Fan Power | | 0.01 | kW | | kW | | kW | 34.7 |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 0.01 | kW | | kW | | kW | 34.7 |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | | bhp | | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7B - Proposed Air-Side HVAC System Schedule

***Instructions:*** *Instructions: Enter all applicable input parameters for the Proposed air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Table 1.4.7B - Proposed Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | All inputs should be consistent with the Proposed energy model and the mechanical drawings and equipment schedules submitted in LEED Online | Split DX | | Packaged DX | | | | |
| System Designation(s) | | Mini-Split Heat Pumps | | DOAS-1 | | | | |
| Number of Similar Systems | | 136 | | 1 | | | | |
| Total Cooling Capacity | | 18 | kBtu/h | 0 | kBtu/h | | kBtu/h | 2,448 |
| *Unitary Cooling Efficiency | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 18.0 SEER / 1 | | 14.0 SEER / 1 | | | | |
| *Unitary Cooling Part-load Efficiency | Indicate the part-load efficiency. Also describe the method for modeling part-load curves if the energy simulation does not have default curves for this equipment type. Enter N/A if not applicable. | n/a | | n/a | | | | |
| Total Heating Capacity | All inputs should be consistent with the Proposed energy model and the mechanical drawings and equipment schedules submitted in LEED Online | 18 | kBtu/h | 80 | kBtu/h | | kBtu/h | 2,528 |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 9.50 HSPF | | 3.41 HSPF | | | | |
| *Fan Control | e.g. Variable Speed Fans, 3-speed ECM fans with automated controls, constant speed, etc. | Constant Volume | | Constant Volume | | | | |
| Supply Airflow | Inputs should be consistent with the mechanical drawings and equipment schedules submitted in LEED Online | 300 | cfm | 0 | cfm | | cfm | 40,800 |
| Outdoor Airflow | Actual minimum outdoor airflow rates consistent with Mechanical Schedule | 248 | cfm | 0 | cfm | | cfm | 33,754 |
| Demand Control Ventilation | Briefly describe how demand control ventilation was modeled | No | | No | | | | |
| *Economizer Control | Describe the type of economizer control and the high limit shutoff. Also indicate if the economizer controls are for less than 100% of the design supply air. | n/a | °F | n/a | °F | | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | e.g. - Supply air temperature reset from 55°F to 62°F based on worst case zone | Constant Temp | | Constant Temp | | | | |
| *Exhaust Air Energy Recovery | If the system includes energy recovery, describe the type of energy recovery and recovery effectiveness (example: enthalpy wheel - 75% effective). Otherwise, enter "N/A". | None | | None | | | | |
| Supply Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.11 | kW | 0.00 | kW | | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | | kW | |
| Exhaust Fan Power | | 0.09 | kW | 0.00 | kW | | kW | |
| System Fan Power | | 0.20 | kW | 0.00 | kW | | kW | 27.3 |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
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| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.8 - Water-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline and Proposed water-side HVAC systems below. All systems included in the model should be entered. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". If taking credit for a campus or district plant efficiency using the DES v2 Option 2 Guidance, please include all relevant information regarding the District Plant equipment in the Proposed Case. For projects using the DES v2 Option 2 Guidance Option 1, or ASHRAE 90.1 Addendum ai for district energy systems, it is recommended that the Proposed Case inputs be completed first, and the description for many Baseline Case inputs will be auto-generated based on the proposed case inputs. Baseline Helpful notes relevant to DES v2 Option 1 and ASHRAE 90.1 Addendum ai are abbreviated as "DESv2#1" and "ai" respectively.*

| | Model Input Parameter | Baseline Helpful Notes | Baseline Case | Units | Proposed Case | Units |
|---|---|---|---|---|---|---|
| Chilled Water | Number and Type of Chillers *(and capacity per chiller if more than one type or size of chiller)* | •***≤300 tons building peak:*** 1 water-cooled screw chiller<br>•***300-600 tons building peak:*** 2 equally-sized water-cooled screw chillers<br>•***≥600 tons building peak:*** At least 2 water-cooled centrifugal chillers (800 tons max per chiller) | | | | |
| | Total Chiller Capacity | Auto-sized with 15% oversizing (unless oversized at the system coil) per G3.1.2.2 | 0 | tons | 0 | tons |
| | Chiller Efficiency - Full Load | Per Table 6.8.1C efficiencies | | kW/Ton | | kW/Ton |
| | Chiller Efficiency - Part Load | | | | | |
| | Chilled Water (CHW) Supply Temp | 44°F per G3.1.3.8 | 44 | °F | 44 | °F |
| | CHW ΔT | 12°F per G3.1.3.8 | | °F | | °F |
| | CHW Supply Temp Reset Parameters | 44°F at outdoor temps 80°F and above, 54°F at outdoor temps 60°F and below, and ramped linearly between 44°F and 54°F at outdoor temps between 80°F and 60°F per G3.1.3.9 | not a DOE-2 capability | | not a DOE-2 capability | |
| | CHW Loop Configuration | Primary/secondary per G3.1.3.10 | Primary Only | | Primary Only | |
| | Number of Primary CHW Pumps | 1 per chiller per G3.1.3.11 | 0 | # | 0 | # |
| | Primary CHW Pump Power | 22 W/gpm per G3.1.3.10 | | W/gpm | | W/gpm |
| | Primary CHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CHW temperatures | | gpm | | gpm |
| | Primary CHW Pump Control | Constant Flow - each primary pump interlocked to operate with associated chiller - G3.1.3.10, G3.1.3.11 | Constant Flow | | Constant Flow | |
| | Number of Secondary CHW Pumps | 1 per G3.1.3.10 | | # | 1 | # |
| | Secondary CHW Pump Power | 22 W/gpm per G3.1.3.10 | | W/gpm | 0.00 | W/gpm |
| | Secondary CHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CHW temperatures | | gpm | 0 | gpm |

| | Model Input Parameter | Baseline Helpful Notes | Baseline Case | Units | Proposed Case | Units |
|---|---|---|---|---|---|---|
| | Secondary CHW Pump Control | ***<300 tons:*** riding the pump curve<br>***≥300 tons:*** variable speed | | | One-Speed / 3 Way Valves | |
| | Water-Side Economizer | Not required | No | | No | |
| | Water-Side Energy Recovery | Not required | | | | |
| Cooling Tower & Condenser Water | Number of Cooling Towers / Fluid Coolers | 1 per G3.1.3.11 | 0 | # | 0 | # |
| | Cooling Tower Fan Power | Minimum 38.2 gpm/hp (maximum 0.0262 hp/gpm or 19.5 W/gpm) per Table 6.8.1G | | gpm/Hp | | gpm/Hp |
| | Cooling Tower Fan Control | Two-speed axial fans per G3.1.3.11 | | | | |
| | Condenser Water (CW) Leaving Temp | 85°F or 10°F approaching design wet-bulb temperature, whichever is lower per G3.1.3.11 | | °F | | °F |
| | CW ΔT | 10°F per G3.1.3.11 | | °F | | °F |
| | CW Loop Temp Reset Parameters | Maintain a 70°F leaving water temperature where weather permits, floating up to leaving water temperature at design conditions per G3.1.3.11 | | | | |
| | Number of CW Pumps | 1 per chiller per G3.1.3.11 | 0 | # | 0 | # |
| | CW Pump Power | 19 W/gpm per G3.1.3.11 | | W/gpm | | W/gpm |
| | CW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CW temperatures | | gpm | | gpm |
| | CW Pump Control | Riding the pump curve per G3.1.3.11 | | | | |
| Hot Water / Steam | Number and Type of Boilers | ***≤15,000 sf:*** 1 natural draft hot water boiler<br>***>15,000 sf:*** 2 equally-sized natural draft hot water boilers staged as required by the load | | | | |
| | Total Boiler Capacity | Auto-sized with 25% oversizing (unless oversized at the system coil) per G3.1.2.2 | | | | |
| | Boiler Efficiency | Per Table 6.8.1F minimum efficiencies | | | | |
| | Hot Water or Steam (HHW) Supply Temp | 180°F per G3.1.3.3 | | °F | | °F |
| | HHW ΔT | 50°F per G3.1.3.3 | | °F | | °F |
| | HHW Temp Reset Parameters | 180°F at outdoor temps 20°F and below, 150°F at outdoor temps 50°F and above, and ramped linearly between 180°F and 150°F at outdoor temps between 20°F and 50°F per G3.1.3.4 | | | Primary Only | |
| | HHW Loop Configuration | Primary-only per G3.1.3.5 | | | 1 | |
| | Number of Primary HHW Pumps | One pump per Boiler | | # | 0 | # |
| | Primary HHW Pump Power | 19 W/gpm per G3.1.3.5 | | W/gpm | 0 | W/gpm |
| | Primary HHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on HHW temperatures | | gpm | One-Speed / 3 Way Valves | gpm |
| | Primary HHW Pump Control | ***<120,000 sf:*** riding the pump curve<br>***≥120,000 sf:*** variable speed | | | | |

# LEED COMPLIANCE SUMMARY (Part 1 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* ECM1 | *5/30/2023* |

## GENERAL INFORMATION

| | | | |
|---|---|---|---|
| Simulation Program: | *EnergyPro* | Weather File: | *TWN_Taipei.466960_IWEC.bin* |
| Principal Heating Source: | *Electric (No Natural Gas Availab* | Climate Zone: | *DOE Climate Zone 2A* |
| Energy Code Used: | *ASHRAE 90.1-2013* | Latitude: | *25* |
| New Construction Percent: | *100* | Longitude: | *122* |

**List the ASHRAE addenda used in the modeling assumptions for EAc1:**

## SPACE SUMMARY

| Space Name / Description | Space Usage Type | Space Size | Regularly Occupied GSF | Unconditioned GSF | Operating Hours (per week) |
|---|---|---|---|---|---|
| *Floor 1* | *Guest Room* | *27411* | *27411* | | *168* |
| *Floor 2* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 3* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 4* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 5* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 6* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 7* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 8* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 9* | *Guest Room* | *14795* | *14795* | | *168* |
| *Undefined Zone* | *Guest Room* | *1* | *1* | | *168* |
| **TOTAL:** | | *145,772* | *145,772* | *0* | |

# LEED COMPLIANCE SUMMARY (Part 2 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## ENERGY TYPE SUMMARY

| Energy Type | Utility Rate Description | Baseline Virtual Rate ($ per unit energy) | Proposed Virtual Rate ($ per unit energy) | Units of Energy | Units of Demand |
|---|---|---|---|---|---|
| Electricity | | | | kWh | kW |
| Natural Gas | | | | therms | MBH |
| | | | | | |
| | | | | | |

## RENEWABLE ENERGY SOURCE SUMMARY

| Renewable Source | Backup Energy Type | Annual Energy Generated | Rated Capacity | Renewable Energy Cost |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## EXCEPTIONAL CALCULATION MEASURE SHORT DESCRIPTION

| Energy Type(s) | Annual Energy Savings by Energy Type | Annual Cost Savings | Exceptional Calculation Measure Narrative: |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# LEED COMPLIANCE SUMMARY (Part 3 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## BASELINE PERFORMANCE – PERFORMANCE RATING METHOD COMPLIANCE

| End Use | Process? | Baseline Design Energy Type | Units of Annual Energy & Peak Demand | Baseline (0 deg rotation) | Baseline (90 deg rotation) | Baseline (180 deg rotation) | Baseline (270 deg rotation) |
|---|---|---|---|---|---|---|---|
| *Interior Lighting* | ☐ | *Electricity* | *kWh* | *435764* | *435764* | *435764* | *435764* |
| | | | *kW* | *119.4* | *119.4* | *119.4* | *119.4* |
| *Exterior Lighting* | ☐ | *Electricity* | *kWh* | *3285* | *3285* | *3285* | *3285* |
| | | | *kW* | *0.8* | *0.8* | *0.8* | *0.8* |
| *Space Heating* | ☐ | *Electricity* | *kWh* | *13048* | *13031* | *12998* | *13025* |
| | | | *kW* | *45.8* | *45.9* | *45.8* | *45.9* |
| *Space Cooling* | ☐ | *Electricity* | *kWh* | *527977* | *525555* | *528384* | *525303* |
| | | | *kW* | *231.8* | *230.3* | *231.7* | *231.1* |
| *Pumps* | ☐ | *Electricity* | *kWh* | *19* | *19* | *19* | *19* |
| | | | *kW* | *0.5* | *0.5* | *0.5* | *0.5* |
| *Fans-Interior* | ☐ | *Electricity* | *kWh* | *303808* | *300257* | *303808* | *300257* |
| | | | *kW* | *34.7* | *34.3* | *34.7* | *34.3* |
| *Service Hot Water* | ☐ | *NaturalGas* | *therms* | *92762* | *92762* | *92762* | *92762* |
| | | | *kBtu/hr* | *2725.2* | *2725.2* | *2725.2* | *2725.2* |
| *Service Hot Water* | ☐ | *Electricity* | *kWh* | *0* | *0* | *0* | *0* |
| | | | *kW* | *0.0* | *0.0* | *0.0* | *0.0* |
| *Receptacle Equipment* | ☑ | *Electricity* | *kWh* | *239431* | *239431* | *239431* | *239431* |
| | | | *kW* | *65.6* | *65.6* | *65.6* | *65.6* |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |

## BASELINE ENERGY COSTS

| Energy Type | Baseline Cost (0 deg rotation) | Baseline Cost (90 deg rotation) | Baseline Cost (180 deg rotation) | Baseline Cost (270 deg rotation) | Baseline Building Performance |
|---|---|---|---|---|---|
| *Electricity* | *0* | *0* | *0* | *0* | *0* |
| *NaturalGas* | *0* | *0* | *0* | *0* | *0* |
| Total Baseline Costs: | *0* | *0* | *0* | *0* | *0* |

# LEED COMPLIANCE SUMMARY (Part 4 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## PERFORMANCE RATING TABLE – PERFORMANCE RATING METHOD COMPLIANCE

| End Use | Process? | Proposed Design Energy Type | Baseline Building Results | Proposed Design Units | Proposed Building Results | Percentage Savings |
|---|---|---|---|---|---|---|
| *Interior Lighting* | ☐ | *Electricity* | *435764* | *kWh* | *311261* | *28.6%* |
| | | | *119.4* | *kW* | *85.3* | *28.6%* |
| *Exterior Lighting* | ☐ | *Electricity* | *3285* | *kWh* | *2628* | *20.0%* |
| | | | *0.8* | *kW* | *0.6* | *20.0%* |
| *Space Heating* | ☐ | *Electricity* | *13025* | *kWh* | *212* | *98.4%* |
| | | | *45.8* | *kW* | *0.0* | *99.9%* |
| *Space Cooling* | ☐ | *Electricity* | *526805* | *kWh* | *459289* | *12.8%* |
| | | | *231.2* | *kW* | *261.8* | *-13.2%* |
| *Pumps* | ☐ | *Electricity* | *19* | *kWh* | *69630* | *-359,880.7%* |
| | | | *0.5* | *kW* | *8.2* | *-1,542.3%* |
| *Fans-Interior* | ☐ | *Electricity* | *302033* | *kWh* | *105120* | *65.2%* |
| | | | *34.5* | *kW* | *12.0* | *65.2%* |
| *Service Hot Water* | ☐ | *NaturalGas* | *92762* | *therms* | *0* | *100.0%* |
| | | | *2725.2* | *kBtu/hr* | *0.0* | *100.0%* |
| *Service Hot Water* | ☐ | *Electricity* | *0* | *kWh* | *1604972* | *0.0%* |
| | | | *0.0* | *kW* | *488.6* | *0.0%* |
| *Receptacle Equipment* | ☑ | *Electricity* | *239431* | *kWh* | *239431* | *0.0%* |
| | | | *65.6* | *kW* | *65.6* | *0.0%* |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |

## ENERGY COST AND CONSUMPTION BY ENERGY TYPE

| | Baseline Design | | | Proposed Design | | | Percent Savings | |
|---|---|---|---|---|---|---|---|---|
| Energy Type | Energy Use | | Cost | Energy Use | | Cost | Energy Use | Cost |
| *Electricity* | *1,520,361* | kWh | *0* | *2,792,542* | kWh | *0* | *-83.7%* | *0.0%* |
| *NaturalGas* | *92,762* | therms | *0* | *0* | therms | *0* | *100.0%* | *0.0%* |
| Subtotal (Model Outputs): | *14,465,208* | (kBtu/year) | *$0* | *9,530,947* | (kBtu/year) | *$0* | *34.1%* | *0.0%* |

## Table 1.4.1 - Opaque Building Envelope

***Instructions:*** *Complete the Opaque Building Envelope Requirements section, then de scribe each unique opaque building envelope construction on a separate row in the Opaque Building Envelope Constructions table (required inputs are green). Note that extra rows can be added using the button to the lower left of each construction type as necessary. An example of the expected level of detail has been provided for each type of construction. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". Baseline Case Information will autogenerate for New Construction Opaque Assemblies when the space conditioning category is selected.*

### Opaque Building Envelope Requirements

For projects modeled using ASHRAE 90.1-2007 Appendix G, select the climate zone: DOE Climate Zone 2A

| | | |
|---|---|---|
| Select the appropriate description for the project: | | ☑ The project is 100% new Construction<br>☐ The project is 100% existing renovation<br>☐ The project is a Cobination of new construction and existing renovation |
| | For existing spaces, have there been any changes to the space conditioning category (for example, previously unconditioned spaces becoming fully conditioned)? | ☑ No Changes to space conditioning categories<br>☐ Yes, and the associated constructions in the Baseline case have been modeled using the Appendix G requirements for new |
| Check the applicable space conditioning categories included in the project: | | ☐ Nonresidential ☑ Residential ☐ Semiheated ☐ Unconditioned |
| | All spaces qualifying as semiheated are not defined as heated per Table 3.1 or indirectly conditioned (see Section 3.2 definition of ***space*** ) | ☐ Yes ☑ N/A (no semiheated spaces) |
| | Opaque envelope assemblies separating conditioned space from unconditioned or semiheated space are modeled using semiheated envelope assemblies per the *ASHRAE 90.1-2007 User's Manual* , Section 5.1.1, *Envelope Component Assemblies* (Page 5-2). | ☑ Yes ☐ N/A (no opaque assemblies separating conditioned and semiheated / unconditioned space) |

| | |
|---|---|
| All ***Baseline new construction opaque envelope assemblies*** were modeled as required by Table 5.5 for the project's climate zone and Table G3.1#5(b) as delayed assemblies. See the Helpful Notes for each opaque assembly for more information. | Yes |
| All ***Proposed*** roofs, above-grade exterior walls, below-grade exterior walls, exposed floors, slab-on-grade floors, and opaque doors were modeled as-designed and with assembly U-factors / C-factors / F-factors consistent with Appendix A values | Yes |
| Infiltration rates and schedules have been modeled identically in the Baseline and Proposed case | Yes |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s) that apply, or the circumstances preventing the opaque envelope parameters from being modeled as required. If the energy simulation software is not capable of modeling the required parameters, describe the adjustments that were made to provide a thermodynamically similar representation or provide a narrative justifying why the predicted energy performance results will not be influenced:***

**Opaque Building Envelope Constructions**

| Model Input Parameter | New / Existing | Space-Conditioning Category | Baseline Case | | Proposed Case | | Baseline Roof Reflectivity Modeled as 0.3? | Proposed Roof Reflectivity Modeled |
|---|---|---|---|---|---|---|---|---|
| | | | Description | Assembly U-factor/ C-factor/ F-factor | Description | Assembly U-factor/ C-factor/ F-factor | | |
| Roof Constructions | Helpful Notes: | | •New roofs: insulation entirely above deck with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing roofs: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | 0.3 per Table G3.1#5(e) | 0.3 or 0.45 per Table G3.1#5(c) |
| | New | Cond | New | 0.039 | Concrete Deck Roof | 0.369 | 0.55 | 0.10 |
| | | | | | | | | |
| Above-Grade Exterior Wall Constructions | Helpful Notes: | | •New above-grade walls: steel-framed with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing above-grade walls: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | New | Cond | New | 0.064 | 6" Concrete Wall | 0.552 | | |
| | | | | | | | | |
| Below-Grade Exterior Wall Constructions | Helpful Notes: | | •New below-grade walls: 8" medium weight concrete block with solid grouted cores as defined in A4.1 with C-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing below-grade walls: existing conditions per Table G3.1#5(f). | | Proposed construction assembly C-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | | | | | | | | |
| | | | | | | | | |
| Exposed Floor Constructions | Helpful Notes: | | •New floors: steel-joist with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing floors: existing conditions per Table G3.1#5(f).<br>•For floor assemblies above unconditioned or semiheated space, select the space conditioning category as semiheated per 90.1-2007 User's Manual, Section 5.1.1-Envelope Component Types (Figure 5-C) | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | | | | | | | | |
| | | | | | | | | |
| Slab-On-Grade Floors | Helpful Notes: | | •New slab-on-grade floors: unheated 6" concrete slab with F-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing slab-on-grade floors: existing conditions per Table G3.1#5(f). | | Proposed construction assembly F-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | New | Cond | New | 0.654 | Slab On Grade | 0.654 | | |
| | | | | | | | | |
| Opaque Doors | Helpful Notes: | | •New opaque doors: U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing opaque doors: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with A7.1 of ASHRAE 90.1 for unlabeled doors | | | |
| | New | Cond | New | 0.500 | Metal Door | 0.700 | | |
| | | | | | | | | |

**Additional notes:**

## Table 1.4.2A - Shading & Orientation

***Instructions:*** *Provide the following shading and orientation information (required inputs are green). An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

| Model Input Parameter | | Baseline Case | | | Proposed Case | | |
|---|---|---|---|---|---|---|---|
| Helpful Notes: | | •All vertical glazing flush with exterior wall and no shading projections per Table G3.1#5(c)<br>•No manual shading devices such as blinds or shades per Table G3.1#5(c)<br>•No self-shading per Table G3.1#5<br>•Total vertical fenestration areas for new construction equal to Proposed up to 40% maximum, and distributed on each face of the building in the same proportions as the Proposed design per Table G3.1#5(c)<br>•Total skylight area for new construction equal to Proposed up to 5% maximum per Table G3.1#5(d) | | | •No manual shading devices such as blinds or shades per Table G3.1#5(d)<br>•Permanent shading devices (such as fins, overhangs, and light shelves) and automatically controlled shades or blinds may be modeled per Table G3.1#5(d)<br>•Shading by adjacent structures and terrain may be modeled, but must be modeled identically in the Baseline case | | |
| Shading Devices | | ☑ No shading projections, manual shading devices, or self-shading have been modeled for the Baseline building<br>☐ Any shading by adjacent structures and terrain has been modeled identically to the Proposed case (if applicable) | | | | | |
| Building Shape & Orientation | | ☑ The Baseline building is modeled with the same shape and orientation as the Proposed building, and for new construction rotated 90°, 180°, and 270° | | | | | |
| Above-Grade Wall & Vertical Glazing Area by Orientation | Orientation | Above Grade Wall Area ($ft^2$) | Vertical Glazing Area | | Above Grade Wall Area ($ft^2$) | Vertical Glazing Area | |
| | | | ($ft^2$) | (%) | | ($ft^2$) | (%) |
| | North | 16,191 | 2,412 | 15% | 16,191 | 2,412 | 15% |
| | East | 14,605 | 3,204 | 22% | 14,605 | 3,204 | 22% |
| | South | 16,187 | 2,412 | 15% | 16,187 | 2,412 | 15% |
| | West | 14,605 | 3,204 | 22% | 14,605 | 3,204 | 22% |
| | **Total** | 61,588 | 11,232 | 18% | 61,588 | 11,232 | 18% |
| Roof & Skylight Area | | Roof Area ($ft^2$) | Skylight Area | | Roof Area ($ft^2$) | Skylight Area | |
| | | | ($ft^2$) | (%) | | ($ft^2$) | (%) |
| | | 27,412 | 0 | 0% | 27,412 | 0 | 0% |

## Table 1.4.2B - Fenestration

***Instructions:*** *Describe each unique fenestration assembly on a separate row in the following table (required inputs are green). Note that additional rows can be expanded using the Add a Line button to the lower left of each fenestration type as necessary. An example of the expected level of detail has been provided for each type of fenestration. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". Baseline Case Information will autogenerate for New Construction Nonresidential or Residential Vertical Glazing and for New Construction Nonresidential skylights when the Baseline Description is selected from one of the items listed.*

| Model Input Parameter | New / Existing | Space Conditioning Category | Baseline Case | | | Proposed Case | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Description | Assembly U-factor | SHGC | Description | Assembly U-factor | SHGC | VLT |
| Vertical Glazing | Helpful Notes: | | •New vertical glazing: assembly U-factor and SHGC from appropriate Table 5.5 per Table G3.1#5(c).<br>•Existing vertical glazing: existing conditions per Table G3.1#5(f). | | | Proposed vertical glazing assembly U-factor should be as-designed and account for the impact of the frames on the whole assembly. Reference Table A8.2 of ASHRAE 90.1 as necessary. | | | |
| | New | Cond | Standard | 0.60 | 0.25 | Proposed Windows | 0.60 | 0.23 | 0.50 |
| | | | | | | | | | |
| Skylights | Helpful Notes: | | •New skylights: assembly U-factor and SHGC from appropriate Table 5.5 per Table G3.1#5(d).<br>•Existing skylights: existing conditions per Table G3.1#5(f). | | | Proposed skylight assembly U-factor should be as-designed and account for the impact of the frames on the whole assembly. Reference Tables A8.1A and A8.1B of ASHRAE 90.1 as necessary. | | | |
| | | | | | | | | | |
| | | | | | | | | | |

How were the Proposed case framed assembly fenestration U-factors determined? NFRC Rated

**Additional notes:**

## Table 1.4.3A - Interior Lighting

***Instructions:*** *Confirm that the energy model complies with the Interior lighting requirements listed, and provide a narrative explaining any discrepancies. Select the interior lighting categorization procedure, and then complete the corresponding lighting table (required inputs are green). An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". For projects using California Title-24, the following Title-24 lighting compliance forms may be uploaded in lieu of this sheet (2008 - LTG-1C, LTG-2C, LTG-3C, LTG-5-C, OLTG-1C, OLTG-2C, SLTG-1C; 2005 - LTG-1C, LTG-2-C, LTG-3-C, LTG-4-C, LTG-5-C, LTG-9-C, OLTG-1-C, OLTG-2-C, OLTG-3-C, OLTG-4-C).*

### Interior Lighting Requirements

| | |
|---|---|
| All lighting schedules have been modeled identically in the Baseline and Proposed case and reflect the anticipated operating schedules of each space | ☑ Yes ☐ No |
| The Proposed lighting power includes all lighting system components shown or provided for on the plans (including lamps and ballasts and task and furniture-mounted fixtures except where specifically exempted) | ☑ Yes ☐ No |
| Per ASHRAE 90.1-2007, Section 9.1.4 (c), and (d):<br>For all **line-voltage lighting track and plug-in busway**, designed to allow the addition and/or relocation of luminaires without altering the wiring of the system, the proposed case wattage is modeled as:<br>(a) the specified wattage of the luminaires included in the sytem with a minimum of 30 W/lin ft, OR<br>(b) the wattage limit of the system's circuit breaker, OR<br>(c) the wattage limit of other permanent current-limiting device(s)<br>For all **low-voltage lighting track, cable conductor, rail conductor,** and other flexible lighting systems that allow the addition and/or relocation of luminaires without altering the wiring of the system, the proposed case wattage is modeled as the wattage of the transformer supplying the | ☐ Yes<br>☐ No<br>☑ N/A |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s) that apply, or the circumstances preventing the lighting parameters from being modeled as required. If the energy simulation software is not capable of modeling the required parameters, describe the adjustments that were made to provide a similar representation or provide a narrative justifying why the predicted energy performance results will not be influenced:***

### Categorization Procedure

| | |
|---|---|
| Select the categorization procedure (Building Area or Space by Space Method) used to determine the lighting power density (LPD) in the Proposed and Baseline case | ☑ Building Area Method<br>☐ Space by Space Method |

### Building Area Method

| Table 9.5.1 Building Area Type | Total Area of Building Type ($ft^2$) | Baseline Case | Proposed Case | | | | |
|---|---|---|---|---|---|---|---|
| | | Modeled LPD ($W/ft^2$) | Design LPD ($W/ft^2$) | Automatic Lighting Controls and Space Types | Table G3.2 Power Adjust-ment | Modeled LPD ($W/ft^2$) | Daylighting Controls |
| Helpful Notes:<br>Parking garages are always considered a separate building area type, and if present in the building, must be listed as a separate building area type from the main building area type | | Modeled using the maximum allowance from Table 9.5.1 ***(values provided for reference - overwrite if modeled differently)*** | •Lighting power should be modeled as designed (or installed) including all lighting system components (lamps and ballasts)<br>•Credit for automatic lighting controls should be modeled using the appropriate power adjustment from Table G3.2, applied only to the controlled lighting power and not where required by 9.4.1.2 per Table G3.1#6(g) [conference rooms; meeting rooms; employee lunch and break rooms; classrooms excepting Pre-K through 12th grade, laboratory, or shop]<br>•Automatic daylighting controls must either be modeled directly in the simulation, or modeled using schedule adjustments determined by a separate daylighting analysis per Table G3.1#6(f) | | | | |
| Guest Room | 145,772 | 0.910 | 0.650 | | 0.000 | 0.650 | |
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| | | | | | | | |
| ***Total*** | 145,772 | 0.910 | 0.650 | | | 0.650 | |

### Interior Process Lighting (if applicable)

| Description | Section 9.2.2.3 Exemption | Total Process Lighting Power (Watts) | Modeled Identically In Baseline? |
|---|---|---|---|
| Helpful Notes: | Any lighting not regulated by ASHRAE 90.1 is considered process and must be modeled identically in the Proposed and Baseline case unless an Exceptional Calculation is submitted | | |
| Process Lighting | | 0 | ☑ Yes ☐ No |

## Table 1.4.4 - Process Equipment

***Instructions:*** *Select the method used to model receptacle equipment, and then complete the corresponding receptacle equipment table (required inputs are green). Other process equipment should be reported in the bottom table. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Process Equipment Requirements

| | |
|---|---|
| All receptacle equipment and other process equipment designed or anticipated for the building have been accounted for in the energy models. | ☑ Yes ☐ No |
| If process energy accounts for less than 25% of the total Baseline energy cost, an additional narrative justification for the low process cost has been provided in the supporting documentation. ***Note: process energy should not be arbitrarily set to 25% of the total Baseline cost, but should reflect the actual process loads anticipated for the building.*** | ☑ Yes ☐ No ☐ N/A(>25%) |

***If any of the process equipment requirements are indicated as "No" above, the project does not likely comply with LEED modeling requirements. It is recommended that the project team pursue a "Credit Interpretation Ruling" to justify the modeling approach. Please also provide any further information below to justify the modeling approach used.***

### Receptacle Equipment Modeling Method

Indicate whether the receptacle equipment was modeled using an average equipment power density for the building, equipment power densities by space type, or by entering the power associated with specific devices in each space (may select more than one)

- ☐ Building Average Equipment Power Density (W/sq.ft.)
- ☑ Space by Space Equipment Power Density (W/sq.ft.)
- ☐ Equipment Power by Device (Watts)

### Space by Space Equipment Power Densities

| Space Type | Total Area of Space Type | Equipment Power Density ($W/ft^2$) | Equipment Included in Power Density | Baseline Modeled Identically? |
|---|---|---|---|---|
| Helpful Notes: | •All receptacle loads must be modeled identically between the Proposed and Baseline case and included in the simulations per Table G3.1#12<br>•Any credit for improved receptacle equipment must be submitted using the Exceptional Calculation Method | | | |
| Guest Room | 145,772 | 0.500 | | Yes |
| | | | | |
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| | | | | |
| | | | | |
| ***Total*** | 145,772 | 0.500 | ***Total Power Modeled Using Space-by-Space Method (kW):*** | 72.9 |

### Other Process Equipment

| Equipment Type (Change/Add Labels as Necessary) | Energy Source | Energy Demand (kW) | Modeling Parameters | Baseline Modeled Identically? |
|---|---|---|---|---|
| Helpful Notes: | •All process loads must be modeled identically between the Proposed and Baseline case and included in the simulations per Table G3.1#12<br>•Any credit for improved process equipment must be submitted using the Exceptional Calculation Method<br>•Exception: When the process or receptacle equipment includes components regulated by minimum efficiency requirements in ASHRAE 90.1, these components may be modeled in the Baseline Case using the minimum ASHRAE 90.1 efficiencies, and in the proposed case using actual proposed case efficiencies (e.g. Baseline may be modeled using furnace efficiencies from Table 6.8.1E, boiler efficiencies from Table 6.8.1G, chiller efficiencies from Table 6.8.1C or Section 6.4.1.2, or motor efficiency from Section 10.4). | | | |
| Elevators/Escalators | | | | |
| Refrigeration Equipment | | | | |
| Kitchen Equipment | | | | |
| Data Center Equipment | | | | |
| Process Loads | elec | 0.0 | | Yes |
| ***Total*** | | | ***Total Power for Other Process Equipment (kW):*** | |
| | | | ***Total Power for Building Process/Receptacle Equipment(kW):*** | |

## Table 1.4.5 - Service Water Heating

***Instructions:*** *Complete the Service Water Heaters table for each unique type of system in the project (required inputs are green). Use the Add a System Type button for more than one type of system. Complete the Service Hot Water Fixtures table if credit is modeled for low-flow fixtures in the Proposed case. If the project includes service hot water circulation pumps, complete the Service Hot Water Pumps table. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Service Water Heaters

| Model Input Parameter | Baseline Case | Proposed Case |
|---|---|---|
| Helpful Notes: | •New systems: minimum performance requirements from Table 7.8 per Table G3.1#11(b)<br>•Existing systems: actual system inputs per Table G3.1#11(a)<br>•Model separate service water heating system when design uses combined system with space heating per Table G3.1#11(e)<br>•Condenser heat recovery as required by 6.5.6.2 per Table G3.1#11(f) | •Service water heaters modeled as designed (or installed) per Table G3.1#11(a&b)<br>•Where no service hot water system exists or has been specified but the building will have service hot water loads, a service hot water system should be modeled identical to the Baseline per Table G3.1#11(c)<br>•For buildings with no service hot water loads, no service hot water system should be modeled per Table G3.1#11(d) |
| System Type & Fuel | Gas Fired | Electric Res |
| Input Rating (kW, MBH, etc.) | 15,359 Btu/hr | 15,359 Btu/hr |
| Efficiency (EF, SL, %, etc.) | 0.600 Energy Factor | 0.980 Energy Factor |
| Storage Volume (gal) | 50.0 gallons | 50.0 gallons |
| Storage Temperature (°F) | 140 F | 140 F |
| Peak Hot Water Demand (gpm) | 58.332 | 58.332 |
| Condenser heat recovery | None | None |

### Service Hot Water Fixtures

***Note:*** *This table is only required to be completed if credit is modeled in the Proposed case for low-flow fixtures*

| Fixture Type | Fixture Outlet Temp (°F) | % Hot Water | Baseline Case | | | Proposed Case | | |
|---|---|---|---|---|---|---|---|---|
| | | | Flow Rate (gpm or gpc) | WEp1 Annual Total Water Consumption (kgal) | Annual Hot Water Consumption (kgal) | Flow Rate (gpm or gpc) | WEp1 Annual Total Water Consumption (kgal) | Annual Hot Water Consumption (kgal) |
| Helpful Notes: | •Refer to Table 3 in Chapter 50 of 2011 ASHRAE Handbook-HVAC Applications for fixture outlet temps used to determine % hot water<br>•% Hot water should account for the DHW supply-to-fixture delta T, and for the percentage hot water versus cold water usage (e.g. residential lavatories would be expected to have cold water usage associated with brushing teeth) | | •Fixtures included in the WEp1 calculations: values must be consistent with the WEp1 form<br>•Additional fixtures not included in WEp1: use Proposed values or provide supporting documentation for Baseline assumption (example: Energy Star documentation of average hot water usage for residential dishwasher or clothes washer) | | | Values should be consistent with the design (or installed) fixtures and WEp1 (if applicable) | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| ***Total*** | | | | | | | | |
| | | | Annual Equivalent Full Load Hours of DHW Operation | | | Annual Equivalent Full Load Hours of DHW Operation | | |
| | | | Calculated Peak Hourly Flow (gal/hour) | | | Calculated Peak Hourly Flow (gal/hour) | | |

### Service Hot Water Pumps

| Model Input Parameter | Baseline Case | Proposed Case |
|---|---|---|
| Helpful Notes: | •Service hot water pumps should be modeled identically between the Proposed and Baseline case<br>•Any credit for improved service hot water pumps must be submitted using the Exceptional Calculation Method | Service hot water pumps modeled as designed (or installed) |
| Number of Pumps | | |
| Total Pump Power (kW) | | |
| Type of Pump (Constant/Variable) | | |
| Pump Control | | |

**Additional notes:**

## Table 1.4.6 - General HVAC

***Instructions:*** *Complete the Special Circumstances section, the Proposed and Baseline HVAC System Type(s) tables, and the HVAC Modeling Requirements checklist below. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Special Circumstances

| | Yes | No |
|---|---|---|
| Is the project building connected to a district or campus thermal energy system where thermal energy is produced for or distributed to multiple buildings? | ☐ | ☐ |

| | |
|---|---|
| The district energy system includes (check all that apply): | ☐ District Cooling ☐ District Heating ☐ CHP |
| Select how the district energy system has been modeled:<br>*Note: "DES v2" refers to the document "Treatment of District or Campus Thermal Energy in LEED V2 and LEED 2009 – Design & Construction" dated August 10, 2010, which can be accessed at http://www.usgbc.org/ShowFile.aspx?DocumentID=7671* | ☐ ASHRAE 90.1-2007 Appendix G without Addenda<br>☐ ASHRAE 90.1-2007 Appendix G Addenda ai<br>☐ California Title-24 Baseline default efficiencies<br>☐ DES v2 Option 1 (Building Stand-Aone)<br>☐ DES v2 Option 2 (Aggregate Building/DES) |
| For DES v2 Option 2, identify the method for evaluating the district plant average efficiency. | ☐ Modeling Method ☐ Monitoring Method |

| | |
|---|---|
| Please indicate all relevant equipment located on the project site: | ☐ Chillers ☐ Cooling Towers / Fluid Coolers ☐ Boilers for Space Heating / Backup Heat<br>☐ Ground Source / Geothermal Heat Pump ☐ Combined Heat & Power (CHP) |

| | Yes | No |
|---|---|---|
| Does the project building include tenant or other unfinished spaces whose systems (HVAC, lighting, etc.) are not included in the project's scope of work? | ☐ | ☐ |

| | |
|---|---|
| Select how the unfinished spaces have been modeled: | ☐ All equipment in the unfinished spaces not included in the project scope of work has been modeled identically in the Baseline and Proposed case using the Baseline modeling requirements.<br>☐ Credit has been modeled in the Proposed case for energy efficiency measures that are specifically identified in signed tenant sales and lease agreements (LEED Core & Shell only. New Construction must be modeled |

### Proposed HVAC System Type(s)

| System Description | Spaces Modeled |
|---|---|
| Helpful Notes: •The HVAC system type and all related parameters, such as equipment capacities and efficiencies, must be modeled as designed (or installed) per Table G3.1#10(a&b)<br>•Where no heating system exists or has been designed, the classification is assumed to be electric and the heating system is modeled identically to the Baseline case per Table G3.1#10(c)<br>•Where no cooling system exists or has been designed, the cooling system is modeled identically to the Baseline case per Table G3.1#10(d) | |
| FCUs | Floor 1 |
| | Floor 2 |
| | Floor 3 |
| | Floor 4 |
| | Floor 5 |
| | Floor 6 |
| | Floor 7 |
| | Floor 8 |
| | Floor 9 |
| DOAS-1 | Undefined Zone |
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**Baseline HVAC System Type(s)**

| Model Input Parameter | Table G3.1.1A System Type (or Semiconditioned System Description) | G3.1.1 Exception (or Semiconditioned Capacity and Area) | Spaces Modeled |
|---|---|---|---|
| Helpful Notes: | •Refer to Section G3.1.1 and Table G3.1.1A (including footnotes) for Primary HVAC System selection | | |
| Primary HVAC System | - Room PTAC | | Floor 1 |
| Primary HVAC System | - Room PTAC | | Floor 2 |
| Primary HVAC System | - Room PTAC | | Floor 3 |
| Primary HVAC System | - Room PTAC | | Floor 4 |
| Primary HVAC System | - Room PTAC | | Floor 5 |
| Primary HVAC System | - Room PTAC | | Floor 6 |
| Primary HVAC System | - Room PTAC | | Floor 7 |
| Primary HVAC System | - Room PTAC | | Floor 8 |
| Primary HVAC System | - Room PTAC | | Floor 9 |
| Primary HVAC System | - Room PTAC | | Undefined Zone |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
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| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Other HVAC System(s) | - | | |
| | - | | |

**HVAC Modeling Requirements**

***Instructions:*** *After completing the information above, click "Refresh Modeling Requirements" to the left. All Proposed and Baseline HVAC system types must be entered above to to generate the correct modeling requirements below. After clicking "Refresh Modeling Requirements", identify each item as "Yes" or "No", and provide a further description for any items marked as "No".*

| | | |
|---|---|---|
| **Proposed HVAC Requirements** | All ***Proposed*** HVAC systems and related parameters, such as equipment capacities, efficiencies, airflows, fans, etc. have been modeled as designed and are consistent with supporting documentation uploaded in LEED Online | Yes |
| | Each ***Proposed*** HVAC thermal zone has been modeled as a separate thermal block except as allowed by Table G3.1#7 | Yes |
| | All ***Proposed*** HVAC systems serving conditioned spaces have been modeled with heating and cooling as required by Table G3.1#1(b), with heating and/or cooling added as necessary identically to the Baseline case per Table G3.1#10(c&d) except where System types (9) or (10) have been modeled in accordance with Addendum dn | Yes |
| | All ***Proposed*** HVAC systems and related parameters can be modeled directly in the energy simulation program used | Yes |
| | All ***Proposed*** fan part-load efficiency curves for variable volume fans have been modeled identically to the Baseline curves for variable volume fans (if not, provide a description of the fan curves used in the space at the bottom of this table, and confirm that the proposed case curves are representative of the actual building design) | Yes |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s)***

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-0 | | Standard System-1 | | Standard System-2 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 1,137 | kBtu/h | 373 | kBtu/h | 373 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 550 | kBtu/h | 99 | kBtu/h | 99 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 13,402 | cfm | 7,599 | cfm | 7,599 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 16,000 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | •50% energy recovery effectiveness<br>•Bypass or control to permit economizer | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm | 3.22 | kW | 1.82 | kW | 1.82 | kW | |
| Return/Relief Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.80 | kW | 0.46 | kW | 0.46 | kW | |
| Exhaust Fan Power | | 12.03 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 16.05 | kW | 2.28 | kW | 2.28 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 16.05 | kW | 2.28 | kW | 2.28 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-3 | | Standard System-4 | | Standard System-5 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 373 | kBtu/h | 373 | kBtu/h | 373 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 99 | kBtu/h | 99 | kBtu/h | 99 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 7,599 | cfm | 7,599 | cfm | 7,599 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 2,219 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 1.82 | kW | 1.82 | kW | 1.82 | kW | |
| Return/Relief Fan Power | | 0.46 | kW | 0.46 | kW | 0.46 | kW | |
| Exhaust Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-6 | | Standard System-7 | | Standard System-8 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 373 | kBtu/h | 373 | kBtu/h | 422 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 99 | kBtu/h | 99 | kBtu/h | 116 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 7,599 | cfm | 7,599 | cfm | 8,916 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 2,219 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 1.82 | kW | 1.82 | kW | 2.14 | kW | |
| Return/Relief Fan Power | | 0.46 | kW | 0.46 | kW | 0.53 | kW | |
| Exhaust Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | | | | | |
| System Designation(s) | Consistent with designations used in model | Standard System-9 | | | | | | |
| Number of Similar Systems | | 1 | | | | | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 0 | kBtu/h | | kBtu/h | | kBtu/h | 4,170 |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 11.9 EER | | | | | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | | | | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 0 | kBtu/h | | kBtu/h | | kBtu/h | 1,358 |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 3.34 COP | | | | | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | | | | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 20 | cfm | | cfm | | cfm | 75,530 |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 0 | cfm | | cfm | | cfm | 33,754 |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | | | | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | | °F | | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | | | | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply | None | | | | | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | •50% energy recovery effectiveness<br>•Bypass or control to permit economizer | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm | 0.00 | kW | | kW | | kW | |
| Return/Relief Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.00 | kW | | kW | | kW | |
| Exhaust Fan Power | | 0.00 | kW | | kW | | kW | |
| System Fan Power | | 0.01 | kW | | kW | | kW | 34.7 |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 0.01 | kW | | kW | | kW | 34.7 |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | | bhp | | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7B - Proposed Air-Side HVAC System Schedule

***Instructions:*** *Instructions: Enter all applicable input parameters for the Proposed air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Table 1.4.7B - Proposed Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | All inputs should be consistent with the Proposed energy model and the mechanical drawings and equipment schedules submitted in LEED Online | 4 Pipe Fan Coil | | Packaged DX | | | | |
| System Designation(s) | | FCUs | | DOAS-1 | | | | |
| Number of Similar Systems | | 136 | | 1 | | | | |
| Total Cooling Capacity | | 18 | kBtu/h | 0 | kBtu/h | | kBtu/h | 2,448 |
| *Unitary Cooling Efficiency | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | n/a | | 14.0 SEER / 1 | | | | |
| *Unitary Cooling Part-load Efficiency | Indicate the part-load efficiency. Also describe the method for modeling part-load curves if the energy simulation does not have default curves for this equipment type. Enter N/A if not applicable. | n/a | | n/a | | | | |
| Total Heating Capacity | All inputs should be consistent with the Proposed energy model and the mechanical drawings and equipment schedules submitted in LEED Online | 0 | kBtu/h | 80 | kBtu/h | | kBtu/h | 80 |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | n/a | | 3.41 HSPF | | | | |
| *Fan Control | e.g. Variable Speed Fans, 3-speed ECM fans with automated controls, constant speed, etc. | Constant Volume | | Constant Volume | | | | |
| Supply Airflow | Inputs should be consistent with the mechanical drawings and equipment schedules submitted in LEED Online | 0 | cfm | 0 | cfm | | cfm | 0 |
| Outdoor Airflow | Actual minimum outdoor airflow rates consistent with Mechanical Schedule | 248 | cfm | 0 | cfm | | cfm | 33,754 |
| Demand Control Ventilation | Briefly describe how demand control ventilation was modeled | No | | No | | | | |
| *Economizer Control | Describe the type of economizer control and the high limit shutoff. Also indicate if the economizer controls are for less than 100% of the design supply air. | n/a | °F | n/a | °F | | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | e.g. - Supply air temperature reset from 55°F to 62°F based on worst case zone | Constant Temp | | Constant Temp | | | | |
| *Exhaust Air Energy Recovery | If the system includes energy recovery, describe the type of energy recovery and recovery effectiveness (example: enthalpy wheel - 75% effective). Otherwise, enter "N/A". | None | | None | | | | |
| Supply Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.00 | kW | 0.00 | kW | | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | | kW | |
| Exhaust Fan Power | | 0.09 | kW | 0.00 | kW | | kW | |
| System Fan Power | | 0.09 | kW | 0.00 | kW | | kW | 12.0 |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
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| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.8 - Water-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline and Proposed water-side HVAC systems below. All systems included in the model should be entered. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". If taking credit for a campus or district plant efficiency using the DES v2 Option 2 Guidance, please include all relevant information regarding the District Plant equipment in the Proposed Case. For projects using the DES v2 Option 2 Guidance Option 1, or ASHRAE 90.1 Addendum ai for district energy systems, it is recommended that the Proposed Case inputs be completed first, and the description for many Baseline Case inputs will be auto-generated based on the proposed case inputs. Baseline Helpful notes relevant to DES v2 Option 1 and ASHRAE 90.1 Addendum ai are abbreviated as "DESv2#1" and "ai" respectively.*

| | Model Input Parameter | Baseline Helpful Notes | Baseline Case | Units | Proposed Case | Units |
|---|---|---|---|---|---|---|
| Chilled Water | Number and Type of Chillers *(and capacity per chiller if more than one type or size of chiller)* | •***≤300 tons building peak:*** 1 water-cooled screw chiller<br>•***300-600 tons building peak:*** 2 equally-sized water-cooled screw chillers<br>•***≥600 tons building peak:*** At least 2 water-cooled centrifugal chillers (800 tons max per chiller) | | | (1) 246.0 tons Scroll | |
| | Total Chiller Capacity | Auto-sized with 15% oversizing (unless oversized at the system coil) per G3.1.2.2 | 0 | tons | 246 | tons |
| | Chiller Efficiency - Full Load | Per Table 6.8.1C efficiencies | | kW/Ton | 1.170, | kW/Ton |
| | Chiller Efficiency - Part Load | | | | | |
| | Chilled Water (CHW) Supply Temp | 44°F per G3.1.3.8 | 44 | °F | 44 | °F |
| | CHW ΔT | 12°F per G3.1.3.8 | | °F | 21, | °F |
| | CHW Supply Temp Reset Parameters | 44°F at outdoor temps 80°F and above, 54°F at outdoor temps 60°F and below, and ramped linearly between 44°F and 54°F at outdoor temps between 80°F and 60°F per G3.1.3.9 | not a DOE-2 capability | | not a DOE-2 capability | |
| | CHW Loop Configuration | Primary/secondary per G3.1.3.10 | Primary Only | | Primary/Secondary | |
| | Number of Primary CHW Pumps | 1 per chiller per G3.1.3.11 | 0 | # | 2 | # |
| | Primary CHW Pump Power | 22 W/gpm per G3.1.3.10 | | W/gpm | 29.05, | W/gpm |
| | Primary CHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CHW temperatures | | gpm | 140, | gpm |
| | Primary CHW Pump Control | Constant Flow - each primary pump interlocked to operate with associated chiller - G3.1.3.10, G3.1.3.11 | Constant Flow | | Constant Flow | |
| | Number of Secondary CHW Pumps | 1 per G3.1.3.10 | | # | 1 | # |
| | Secondary CHW Pump Power | 22 W/gpm per G3.1.3.10 | | W/gpm | 0.00 | W/gpm |
| | Secondary CHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CHW temperatures | | gpm | 0 | gpm |

| | Model Input Parameter | Baseline Helpful Notes | Baseline Case | Units | Proposed Case | Units |
|---|---|---|---|---|---|---|
| | Secondary CHW Pump Control | ***<300 tons:*** riding the pump curve<br>***≥300 tons:*** variable speed | | | One-Speed / 3 Way Valves | |
| | Water-Side Economizer | Not required | No | | No | |
| | Water-Side Energy Recovery | Not required | | | | |
| Cooling Tower & Condenser Water | Number of Cooling Towers / Fluid Coolers | 1 per G3.1.3.11 | 0 | # | 0 | # |
| | Cooling Tower Fan Power | Minimum 38.2 gpm/hp (maximum 0.0262 hp/gpm or 19.5 W/gpm) per Table 6.8.1G | | gpm/Hp | | gpm/Hp |
| | Cooling Tower Fan Control | Two-speed axial fans per G3.1.3.11 | | | | |
| | Condenser Water (CW) Leaving Temp | 85°F or 10°F approaching design wet-bulb temperature, whichever is lower per G3.1.3.11 | | °F | | °F |
| | CW ΔT | 10°F per G3.1.3.11 | | °F | | °F |
| | CW Loop Temp Reset Parameters | Maintain a 70°F leaving water temperature where weather permits, floating up to leaving water temperature at design conditions per G3.1.3.11 | | | | |
| | Number of CW Pumps | 1 per chiller per G3.1.3.11 | 0 | # | 0 | # |
| | CW Pump Power | 19 W/gpm per G3.1.3.11 | | W/gpm | | W/gpm |
| | CW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CW temperatures | | gpm | | gpm |
| | CW Pump Control | Riding the pump curve per G3.1.3.11 | | | | |
| Hot Water / Steam | Number and Type of Boilers | ***≤15,000 sf:*** 1 natural draft hot water boiler<br>***>15,000 sf:*** 2 equally-sized natural draft hot water boilers staged as required by the load | | | | |
| | Total Boiler Capacity | Auto-sized with 25% oversizing (unless oversized at the system coil) per G3.1.2.2 | | | | |
| | Boiler Efficiency | Per Table 6.8.1F minimum efficiencies | | | | |
| | Hot Water or Steam (HHW) Supply Temp | 180°F per G3.1.3.3 | | °F | | °F |
| | HHW ΔT | 50°F per G3.1.3.3 | | °F | | °F |
| | HHW Temp Reset Parameters | 180°F at outdoor temps 20°F and below, 150°F at outdoor temps 50°F and above, and ramped linearly between 180°F and 150°F at outdoor temps between 20°F and 50°F per G3.1.3.4 | | | | |
| | HHW Loop Configuration | Primary-only per G3.1.3.5 | | | | |
| | Number of Primary HHW Pumps | One pump per Boiler | | # | | # |
| | Primary HHW Pump Power | 19 W/gpm per G3.1.3.5 | | W/gpm | | W/gpm |
| | Primary HHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on HHW temperatures | | gpm | | gpm |
| | Primary HHW Pump Control | ***<120,000 sf:*** riding the pump curve<br>***≥120,000 sf:*** variable speed | | | | |

# LEED COMPLIANCE SUMMARY (Part 1 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## GENERAL INFORMATION

| | | | |
|---|---|---|---|
| Simulation Program: | *EnergyPro* | Weather File: | *TWN_Taipei.466960_IWEC.bin* |
| Principal Heating Source: | *Electric (No Natural Gas Availab* | Climate Zone: | *DOE Climate Zone 2A* |
| Energy Code Used: | *ASHRAE 90.1-2013* | Latitude: | *25* |
| New Construction Percent: | *100* | Longitude: | *122* |

**List the ASHRAE addenda used in the modeling assumptions for EAc1:**

## SPACE SUMMARY

| Space Name / Description | Space Usage Type | Space Size | Regularly Occupied GSF | Unconditioned GSF | Operating Hours (per week) |
|---|---|---|---|---|---|
| *Floor 1* | *Guest Room* | *27411* | *27411* | | *168* |
| *Floor 2* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 3* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 4* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 5* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 6* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 7* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 8* | *Guest Room* | *14795* | *14795* | | *168* |
| *Floor 9* | *Guest Room* | *14795* | *14795* | | *168* |
| *Undefined Zone* | *Guest Room* | *1* | *1* | | *168* |
| **TOTAL:** | | *145,772* | *145,772* | *0* | |

# LEED COMPLIANCE SUMMARY (Part 2 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## ENERGY TYPE SUMMARY

| Energy Type | Utility Rate Description | Baseline Virtual Rate ($ per unit energy) | Proposed Virtual Rate ($ per unit energy) | Units of Energy | Units of Demand |
|---|---|---|---|---|---|
| Electricity | | | | kWh | kW |
| Natural Gas | | | | therms | MBH |
| | | | | | |
| | | | | | |

## RENEWABLE ENERGY SOURCE SUMMARY

| Renewable Source | Backup Energy Type | Annual Energy Generated | Rated Capacity | Renewable Energy Cost |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
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## EXCEPTIONAL CALCULATION MEASURE SHORT DESCRIPTION

| Energy Type(s) | Annual Energy Savings by Energy Type | Annual Cost Savings | Exceptional Calculation Measure Narrative: |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |
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# LEED COMPLIANCE SUMMARY (Part 3 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## BASELINE PERFORMANCE – PERFORMANCE RATING METHOD COMPLIANCE

| End Use | Process? | Baseline Design Energy Type | Units of Annual Energy & Peak Demand | Baseline (0 deg rotation) | Baseline (90 deg rotation) | Baseline (180 deg rotation) | Baseline (270 deg rotation) |
|---|---|---|---|---|---|---|---|
| *Interior Lighting* | ☐ | *Electricity* | *kWh* | *435764* | *435764* | *435764* | *435764* |
| | | | *kW* | *119.4* | *119.4* | *119.4* | *119.4* |
| *Exterior Lighting* | ☐ | *Electricity* | *kWh* | *3285* | *3285* | *3285* | *3285* |
| | | | *kW* | *0.8* | *0.8* | *0.8* | *0.8* |
| *Space Heating* | ☐ | *Electricity* | *kWh* | *12693* | *12669* | *12650* | *12670* |
| | | | *kW* | *45.6* | *45.7* | *45.5* | *45.7* |
| *Space Cooling* | ☐ | *Electricity* | *kWh* | *531800* | *529529* | *532207* | *529278* |
| | | | *kW* | *232.3* | *230.8* | *232.2* | *231.6* |
| *Pumps* | ☐ | *Electricity* | *kWh* | *19* | *19* | *19* | *19* |
| | | | *kW* | *0.5* | *0.5* | *0.5* | *0.5* |
| *Fans-Interior* | ☐ | *Electricity* | *kWh* | *303644* | *300038* | *303644* | *300038* |
| | | | *kW* | *34.7* | *34.3* | *34.7* | *34.3* |
| *Service Hot Water* | ☐ | *NaturalGas* | *therms* | *92762* | *92762* | *92762* | *92762* |
| | | | *kBtu/hr* | *2725.2* | *2725.2* | *2725.2* | *2725.2* |
| *Service Hot Water* | ☐ | *Electricity* | *kWh* | *0* | *0* | *0* | *0* |
| | | | *kW* | *0.0* | *0.0* | *0.0* | *0.0* |
| *Receptacle Equipment* | ☑ | *Electricity* | *kWh* | *239431* | *239431* | *239431* | *239431* |
| | | | *kW* | *65.6* | *65.6* | *65.6* | *65.6* |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |
| | ☐ | | | | | | |
| | | | | | | | |

## BASELINE ENERGY COSTS

| Energy Type | Baseline Cost (0 deg rotation) | Baseline Cost (90 deg rotation) | Baseline Cost (180 deg rotation) | Baseline Cost (270 deg rotation) | Baseline Building Performance |
|---|---|---|---|---|---|
| *Electricity* | *0* | *0* | *0* | *0* | *0* |
| *NaturalGas* | *0* | *0* | *0* | *0* | *0* |
| Total Baseline Costs: | *0* | *0* | *0* | *0* | *0* |

# LEED COMPLIANCE SUMMARY (Part 4 of 4) EAP-2

| Project Name | Date |
|---|---|
| *T4511 Courtney Tower* | *5/30/2023* |

## PERFORMANCE RATING TABLE – PERFORMANCE RATING METHOD COMPLIANCE

| End Use | Process? | Proposed Design Energy Type | Baseline Building Results | Proposed Design Units | Proposed Building Results | Percentage Savings |
|---|---|---|---|---|---|---|
| *Interior Lighting* | ☐ | *Electricity* | *435764* | *kWh* | *311261* | *28.6%* |
| | | | *119.4* | *kW* | *85.3* | *28.6%* |
| *Exterior Lighting* | ☐ | *Electricity* | *3285* | *kWh* | *2628* | *20.0%* |
| | | | *0.8* | *kW* | *0.6* | *20.0%* |
| *Space Heating* | ☐ | *Electricity* | *12670* | *kWh* | *53968* | *-325.9%* |
| | | | *45.6* | *kW* | *296.7* | *-550.3%* |
| *Space Cooling* | ☐ | *Electricity* | *530704* | *kWh* | *461825* | *13.0%* |
| | | | *231.7* | *kW* | *207.7* | *10.4%* |
| *Pumps* | ☐ | *Electricity* | *19* | *kWh* | *5* | *76.2%* |
| | | | *0.5* | *kW* | *0.1* | *80.0%* |
| *Fans-Interior* | ☐ | *Electricity* | *301841* | *kWh* | *239148* | *20.8%* |
| | | | *34.5* | *kW* | *27.3* | *20.8%* |
| *Service Hot Water* | ☐ | *NaturalGas* | *92762* | *therms* | *0* | *100.0%* |
| | | | *2725.2* | *kBtu/hr* | *0.0* | *100.0%* |
| *Service Hot Water* | ☐ | *Electricity* | *0* | *kWh* | *1604972* | *0.0%* |
| | | | *0.0* | *kW* | *488.6* | *0.0%* |
| *Receptacle Equipment* | ☑ | *Electricity* | *239431* | *kWh* | *239431* | *0.0%* |
| | | | *65.6* | *kW* | *65.6* | *0.0%* |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |
| | ☐ | | | | | |
| | | | | | | |

## ENERGY COST AND CONSUMPTION BY ENERGY TYPE

| | Baseline Design | | | Proposed Design | | | Percent Savings | |
|---|---|---|---|---|---|---|---|---|
| Energy Type | Energy Use | | Cost | Energy Use | | Cost | Energy Use | Cost |
| *Electricity* | *1,523,713* | kWh | *0* | *2,913,236* | kWh | *0* | *-91.2%* | *0.0%* |
| *NaturalGas* | *92,762* | therms | *0* | *0* | therms | *0* | *100.0%* | *0.0%* |
| Subtotal (Model Outputs): | *14,476,648* | (kBtu/year) | *$0* | *9,942,875* | (kBtu/year) | *$0* | *31.3%* | *0.0%* |

## Table 1.4.1 - Opaque Building Envelope

***Instructions:*** *Complete the Opaque Building Envelope Requirements section, then de scribe each unique opaque building envelope construction on a separate row in the Opaque Building Envelope Constructions table (required inputs are green). Note that extra rows can be added using the button to the lower left of each construction type as necessary. An example of the expected level of detail has been provided for each type of construction. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". Baseline Case Information will autogenerate for New Construction Opaque Assemblies when the space conditioning category is selected.*

### Opaque Building Envelope Requirements

For projects modeled using ASHRAE 90.1-2007 Appendix G, select the climate zone: DOE Climate Zone 2A

| | | |
|---|---|---|
| Select the appropriate description for the project: | | ☑ The project is 100% new Construction<br>☐ The project is 100% existing renovation<br>☐ The project is a Cobination of new construction and existing renovation |
| | For existing spaces, have there been any changes to the space conditioning category (for example, previously unconditioned spaces becoming fully conditioned)? | ☑ No Changes to space conditioning categories<br>☐ Yes, and the associated constructions in the Baseline case have been modeled using the Appendix G requirements for new |
| Check the applicable space conditioning categories included in the project: | | ☐ Nonresidential ☑ Residential ☐ Semiheated ☐ Unconditioned |
| | All spaces qualifying as semiheated are not defined as heated per Table 3.1 or indirectly conditioned (see Section 3.2 definition of ***space*** ) | ☐ Yes ☑ N/A (no semiheated spaces) |
| | Opaque envelope assemblies separating conditioned space from unconditioned or semiheated space are modeled using semiheated envelope assemblies per the *ASHRAE 90.1-2007 User's Manual* , Section 5.1.1, *Envelope Component Assemblies* (Page 5-2). | ☑ Yes ☐ N/A (no opaque assemblies separating conditioned and semiheated / unconditioned space) |

| | |
|---|---|
| All ***Baseline new construction opaque envelope assemblies*** were modeled as required by Table 5.5 for the project's climate zone and Table G3.1#5(b) as delayed assemblies. See the Helpful Notes for each opaque assembly for more information. | Yes |
| All ***Proposed*** roofs, above-grade exterior walls, below-grade exterior walls, exposed floors, slab-on-grade floors, and opaque doors were modeled as-designed and with assembly U-factors / C-factors / F-factors consistent with Appendix A values | Yes |
| Infiltration rates and schedules have been modeled identically in the Baseline and Proposed case | Yes |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s) that apply, or the circumstances preventing the opaque envelope parameters from being modeled as required. If the energy simulation software is not capable of modeling the required parameters, describe the adjustments that were made to provide a thermodynamically similar representation or provide a narrative justifying why the predicted energy performance results will not be influenced:***

**Opaque Building Envelope Constructions**

| Model Input Parameter | New / Existing | Space-Conditioning Category | Baseline Case | | Proposed Case | | Baseline Roof Reflectivity Modeled as 0.3? | Proposed Roof Reflectivity Modeled |
|---|---|---|---|---|---|---|---|---|
| | | | Description | Assembly U-factor/ C-factor/ F-factor | Description | Assembly U-factor/ C-factor/ F-factor | | |
| Roof Constructions | Helpful Notes: | | •New roofs: insulation entirely above deck with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing roofs: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | 0.3 per Table G3.1#5(e) | 0.3 or 0.45 per Table G3.1#5(c) |
| | New | Cond | New | 0.039 | Concrete Deck Roof | 0.369 | 0.55 | 0.10 |
| | | | | | | | | |
| Above-Grade Exterior Wall Constructions | Helpful Notes: | | •New above-grade walls: steel-framed with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing above-grade walls: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | New | Cond | New | 0.064 | 6" Concrete Wall | 0.552 | | |
| | | | | | | | | |
| Below-Grade Exterior Wall Constructions | Helpful Notes: | | •New below-grade walls: 8" medium weight concrete block with solid grouted cores as defined in A4.1 with C-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing below-grade walls: existing conditions per Table G3.1#5(f). | | Proposed construction assembly C-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | | | | | | | | |
| | | | | | | | | |
| Exposed Floor Constructions | Helpful Notes: | | •New floors: steel-joist with U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing floors: existing conditions per Table G3.1#5(f).<br>•For floor assemblies above unconditioned or semiheated space, select the space conditioning category as semiheated per 90.1-2007 User's Manual, Section 5.1.1-Envelope Component Types (Figure 5-C) | | Proposed construction assembly U-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | | | | | | | | |
| | | | | | | | | |
| Slab-On-Grade Floors | Helpful Notes: | | •New slab-on-grade floors: unheated 6" concrete slab with F-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing slab-on-grade floors: existing conditions per Table G3.1#5(f). | | Proposed construction assembly F-factor should be as-designed and consistent with Appendix A of ASHRAE 90.1 (list Appendix A Table referenced) | | | |
| | New | Cond | New | 0.654 | Slab On Grade | 0.654 | | |
| | | | | | | | | |
| Opaque Doors | Helpful Notes: | | •New opaque doors: U-factor from appropriate Table 5.5 per Table G3.1#5(b).<br>•Existing opaque doors: existing conditions per Table G3.1#5(f). | | Proposed construction assembly U-factor should be as-designed and consistent with A7.1 of ASHRAE 90.1 for unlabeled doors | | | |
| | New | Cond | New | 0.500 | Metal Door | 0.700 | | |
| | | | | | | | | |

**Additional notes:**

## Table 1.4.2A - Shading & Orientation

***Instructions:*** *Provide the following shading and orientation information (required inputs are green). An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

| Model Input Parameter | | Baseline Case | | | Proposed Case | | |
|---|---|---|---|---|---|---|---|
| Helpful Notes: | | •All vertical glazing flush with exterior wall and no shading projections per Table G3.1#5(c)<br>•No manual shading devices such as blinds or shades per Table G3.1#5(c)<br>•No self-shading per Table G3.1#5<br>•Total vertical fenestration areas for new construction equal to Proposed up to 40% maximum, and distributed on each face of the building in the same proportions as the Proposed design per Table G3.1#5(c)<br>•Total skylight area for new construction equal to Proposed up to 5% maximum per Table G3.1#5(d) | | | •No manual shading devices such as blinds or shades per Table G3.1#5(d)<br>•Permanent shading devices (such as fins, overhangs, and light shelves) and automatically controlled shades or blinds may be modeled per Table G3.1#5(d)<br>•Shading by adjacent structures and terrain may be modeled, but must be modeled identically in the Baseline case | | |
| Shading Devices | | ☑ No shading projections, manual shading devices, or self-shading have been modeled for the Baseline building<br>☐ Any shading by adjacent structures and terrain has been modeled identically to the Proposed case (if applicable) | | | | | |
| Building Shape & Orientation | | ☑ The Baseline building is modeled with the same shape and orientation as the Proposed building, and for new construction rotated 90°, 180°, and 270° | | | | | |
| Above-Grade Wall & Vertical Glazing Area by Orientation | Orientation | Above Grade Wall Area ($ft^2$) | Vertical Glazing Area | | Above Grade Wall Area ($ft^2$) | Vertical Glazing Area | |
| | | | ($ft^2$) | (%) | | ($ft^2$) | (%) |
| | North | 16,191 | 2,412 | 15% | 16,191 | 2,412 | 15% |
| | East | 14,605 | 3,204 | 22% | 14,605 | 3,204 | 22% |
| | South | 16,187 | 2,412 | 15% | 16,187 | 2,412 | 15% |
| | West | 14,605 | 3,204 | 22% | 14,605 | 3,204 | 22% |
| | **Total** | 61,588 | 11,232 | 18% | 61,588 | 11,232 | 18% |
| Roof & Skylight Area | | Roof Area ($ft^2$) | Skylight Area | | Roof Area ($ft^2$) | Skylight Area | |
| | | | ($ft^2$) | (%) | | ($ft^2$) | (%) |
| | | 27,412 | 0 | 0% | 27,412 | 0 | 0% |

## Table 1.4.2B - Fenestration

***Instructions:*** *Describe each unique fenestration assembly on a separate row in the following table (required inputs are green). Note that additional rows can be expanded using the Add a Line button to the lower left of each fenestration type as necessary. An example of the expected level of detail has been provided for each type of fenestration. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". Baseline Case Information will autogenerate for New Construction Nonresidential or Residential Vertical Glazing and for New Construction Nonresidential skylights when the Baseline Description is selected from one of the items listed.*

| Model Input Parameter | New / Existing | Space Conditioning Category | Baseline Case | | | Proposed Case | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Description | Assembly U-factor | SHGC | Description | Assembly U-factor | SHGC | VLT |
| Vertical Glazing | Helpful Notes: | | •New vertical glazing: assembly U-factor and SHGC from appropriate Table 5.5 per Table G3.1#5(c).<br>•Existing vertical glazing: existing conditions per Table G3.1#5(f). | | | Proposed vertical glazing assembly U-factor should be as-designed and account for the impact of the frames on the whole assembly. Reference Table A8.2 of ASHRAE 90.1 as necessary. | | | |
| | New | Cond | Standard | 0.60 | 0.25 | Proposed Windows | 0.60 | 0.23 | 0.50 |
| | | | | | | | | | |
| Skylights | Helpful Notes: | | •New skylights: assembly U-factor and SHGC from appropriate Table 5.5 per Table G3.1#5(d).<br>•Existing skylights: existing conditions per Table G3.1#5(f). | | | Proposed skylight assembly U-factor should be as-designed and account for the impact of the frames on the whole assembly. Reference Tables A8.1A and A8.1B of ASHRAE 90.1 as necessary. | | | |
| | | | | | | | | | |
| | | | | | | | | | |

How were the Proposed case framed assembly fenestration U-factors determined? NFRC Rated

**Additional notes:**

## Table 1.4.3A - Interior Lighting

***Instructions:*** *Confirm that the energy model complies with the Interior lighting requirements listed, and provide a narrative explaining any discrepancies. Select the interior lighting categorization procedure, and then complete the corresponding lighting table (required inputs are green). An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". For projects using California Title-24, the following Title-24 lighting compliance forms may be uploaded in lieu of this sheet (2008 - LTG-1C, LTG-2C, LTG-3C, LTG-5-C, OLTG-1C, OLTG-2C, SLTG-1C; 2005 - LTG-1C, LTG-2-C, LTG-3-C, LTG-4-C, LTG-5-C, LTG-9-C, OLTG-1-C, OLTG-2-C, OLTG-3-C, OLTG-4-C).*

### Interior Lighting Requirements

| | |
|---|---|
| All lighting schedules have been modeled identically in the Baseline and Proposed case and reflect the anticipated operating schedules of each space | ☑ Yes ☐ No |
| The Proposed lighting power includes all lighting system components shown or provided for on the plans (including lamps and ballasts and task and furniture-mounted fixtures except where specifically exempted) | ☑ Yes ☐ No |
| Per ASHRAE 90.1-2007, Section 9.1.4 (c), and (d):<br>For all **line-voltage lighting track and plug-in busway**, designed to allow the addition and/or relocation of luminaires without altering the wiring of the system, the proposed case wattage is modeled as:<br>(a) the specified wattage of the luminaires included in the sytem with a minimum of 30 W/lin ft, OR<br>(b) the wattage limit of the system's circuit breaker, OR<br>(c) the wattage limit of other permanent current-limiting device(s)<br>For all **low-voltage lighting track, cable conductor, rail conductor,** and other flexible lighting systems that allow the addition and/or relocation of luminaires without altering the wiring of the system, the proposed case wattage is modeled as the wattage of the transformer supplying the | ☐ Yes<br>☐ No<br>☑ N/A |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s) that apply, or the circumstances preventing the lighting parameters from being modeled as required. If the energy simulation software is not capable of modeling the required parameters, describe the adjustments that were made to provide a similar representation or provide a narrative justifying why the predicted energy performance results will not be influenced:***

### Categorization Procedure

| | |
|---|---|
| Select the categorization procedure (Building Area or Space by Space Method) used to determine the lighting power density (LPD) in the Proposed and Baseline case | ☑ Building Area Method<br>☐ Space by Space Method |

### Building Area Method

| Table 9.5.1 Building Area Type | Total Area of Building Type ($ft^2$) | Baseline Case | Proposed Case | | | | |
|---|---|---|---|---|---|---|---|
| | | Modeled LPD ($W/ft^2$) | Design LPD ($W/ft^2$) | Automatic Lighting Controls and Space Types | Table G3.2 Power Adjust-ment | Modeled LPD ($W/ft^2$) | Daylighting Controls |
| Helpful Notes:<br>Parking garages are always considered a separate building area type, and if present in the building, must be listed as a separate building area type from the main building area type | | Modeled using the maximum allowance from Table 9.5.1 ***(values provided for reference - overwrite if modeled differently)*** | •Lighting power should be modeled as designed (or installed) including all lighting system components (lamps and ballasts)<br>•Credit for automatic lighting controls should be modeled using the appropriate power adjustment from Table G3.2, applied only to the controlled lighting power and not where required by 9.4.1.2 per Table G3.1#6(g) [conference rooms; meeting rooms; employee lunch and break rooms; classrooms excepting Pre-K through 12th grade, laboratory, or shop]<br>•Automatic daylighting controls must either be modeled directly in the simulation, or modeled using schedule adjustments determined by a separate daylighting analysis per Table G3.1#6(f) | | | | |
| Guest Room | 145,772 | 0.910 | 0.650 | | 0.000 | 0.650 | |
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| | | | | | | | |
| ***Total*** | 145,772 | 0.910 | 0.650 | | | 0.650 | |

### Interior Process Lighting (if applicable)

| Description | Section 9.2.2.3 Exemption | Total Process Lighting Power (Watts) | Modeled Identically In Baseline? |
|---|---|---|---|
| Helpful Notes: | Any lighting not regulated by ASHRAE 90.1 is considered process and must be modeled identically in the Proposed and Baseline case unless an Exceptional Calculation is submitted | | |
| Process Lighting | | 0 | ☑ Yes ☐ No |

## Table 1.4.4 - Process Equipment

***Instructions:*** *Select the method used to model receptacle equipment, and then complete the corresponding receptacle equipment table (required inputs are green). Other process equipment should be reported in the bottom table. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Process Equipment Requirements

| | |
|---|---|
| All receptacle equipment and other process equipment designed or anticipated for the building have been accounted for in the energy models. | ☑ Yes ☐ No |
| If process energy accounts for less than 25% of the total Baseline energy cost, an additional narrative justification for the low process cost has been provided in the supporting documentation. ***Note: process energy should not be arbitrarily set to 25% of the total Baseline cost, but should reflect the actual process loads anticipated for the building.*** | ☑ Yes ☐ No ☐ N/A(>25%) |

***If any of the process equipment requirements are indicated as "No" above, the project does not likely comply with LEED modeling requirements. It is recommended that the project team pursue a "Credit Interpretation Ruling" to justify the modeling approach. Please also provide any further information below to justify the modeling approach used.***

### Receptacle Equipment Modeling Method

Indicate whether the receptacle equipment was modeled using an average equipment power density for the building, equipment power densities by space type, or by entering the power associated with specific devices in each space (may select more than one)

- ☐ Building Average Equipment Power Density (W/sq.ft.)
- ☑ Space by Space Equipment Power Density (W/sq.ft.)
- ☐ Equipment Power by Device (Watts)

### Space by Space Equipment Power Densities

| Space Type | Total Area of Space Type | Equipment Power Density ($W/ft^2$) | Equipment Included in Power Density | Baseline Modeled Identically? |
|---|---|---|---|---|
| Helpful Notes: | •All receptacle loads must be modeled identically between the Proposed and Baseline case and included in the simulations per Table G3.1#12<br>•Any credit for improved receptacle equipment must be submitted using the Exceptional Calculation Method | | | |
| Guest Room | 145,772 | 0.500 | | Yes |
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| | | | | |
| ***Total*** | 145,772 | 0.500 | ***Total Power Modeled Using Space-by-Space Method (kW):*** | 72.9 |

### Other Process Equipment

| Equipment Type (Change/Add Labels as Necessary) | Energy Source | Energy Demand (kW) | Modeling Parameters | Baseline Modeled Identically? |
|---|---|---|---|---|
| Helpful Notes: | •All process loads must be modeled identically between the Proposed and Baseline case and included in the simulations per Table G3.1#12<br>•Any credit for improved process equipment must be submitted using the Exceptional Calculation Method<br>•Exception: When the process or receptacle equipment includes components regulated by minimum efficiency requirements in ASHRAE 90.1, these components may be modeled in the Baseline Case using the minimum ASHRAE 90.1 efficiencies, and in the proposed case using actual proposed case efficiencies (e.g. Baseline may be modeled using furnace efficiencies from Table 6.8.1E, boiler efficiencies from Table 6.8.1G, chiller efficiencies from Table 6.8.1C or Section 6.4.1.2, or motor efficiency from Section 10.4). | | | |
| Elevators/Escalators | | | | |
| Refrigeration Equipment | | | | |
| Kitchen Equipment | | | | |
| Data Center Equipment | | | | |
| Process Loads | elec | 0.0 | | Yes |
| ***Total*** | | | ***Total Power for Other Process Equipment (kW):*** | |
| | | | ***Total Power for Building Process/Receptacle Equipment(kW):*** | |

## Table 1.4.5 - Service Water Heating

***Instructions:*** *Complete the Service Water Heaters table for each unique type of system in the project (required inputs are green). Use the Add a System Type button for more than one type of system. Complete the Service Hot Water Fixtures table if credit is modeled for low-flow fixtures in the Proposed case. If the project includes service hot water circulation pumps, complete the Service Hot Water Pumps table. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Service Water Heaters

| Model Input Parameter | Baseline Case | Proposed Case |
|---|---|---|
| Helpful Notes: | •New systems: minimum performance requirements from Table 7.8 per Table G3.1#11(b)<br>•Existing systems: actual system inputs per Table G3.1#11(a)<br>•Model separate service water heating system when design uses combined system with space heating per Table G3.1#11(e)<br>•Condenser heat recovery as required by 6.5.6.2 per Table G3.1#11(f) | •Service water heaters modeled as designed (or installed) per Table G3.1#11(a&b)<br>•Where no service hot water system exists or has been specified but the building will have service hot water loads, a service hot water system should be modeled identical to the Baseline per Table G3.1#11(c)<br>•For buildings with no service hot water loads, no service hot water system should be modeled per Table G3.1#11(d) |
| System Type & Fuel | Gas Fired | Electric Res |
| Input Rating (kW, MBH, etc.) | 15,359 Btu/hr | 15,359 Btu/hr |
| Efficiency (EF, SL, %, etc.) | 0.600 Energy Factor | 0.980 Energy Factor |
| Storage Volume (gal) | 50.0 gallons | 50.0 gallons |
| Storage Temperature (°F) | 140 F | 140 F |
| Peak Hot Water Demand (gpm) | 58.332 | 58.332 |
| Condenser heat recovery | None | None |

### Service Hot Water Fixtures

***Note:*** *This table is only required to be completed if credit is modeled in the Proposed case for low-flow fixtures*

| Fixture Type | Fixture Outlet Temp (°F) | % Hot Water | Baseline Case | | | Proposed Case | | |
|---|---|---|---|---|---|---|---|---|
| | | | Flow Rate (gpm or gpc) | WEp1 Annual Total Water Consumption (kgal) | Annual Hot Water Consumption (kgal) | Flow Rate (gpm or gpc) | WEp1 Annual Total Water Consumption (kgal) | Annual Hot Water Consumption (kgal) |
| Helpful Notes: | •Refer to Table 3 in Chapter 50 of 2011 ASHRAE Handbook-HVAC Applications for fixture outlet temps used to determine % hot water<br>•% Hot water should account for the DHW supply-to-fixture delta T, and for the percentage hot water versus cold water usage (e.g. residential lavatories would be expected to have cold water usage associated with brushing teeth) | | •Fixtures included in the WEp1 calculations: values must be consistent with the WEp1 form<br>•Additional fixtures not included in WEp1: use Proposed values or provide supporting documentation for Baseline assumption (example: Energy Star documentation of average hot water usage for residential dishwasher or clothes washer) | | | Values should be consistent with the design (or installed) fixtures and WEp1 (if applicable) | | |
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| | | | | | | | | |
| ***Total*** | | | | | | | | |
| | | | Annual Equivalent Full Load Hours of DHW Operation | | | Annual Equivalent Full Load Hours of DHW Operation | | |
| | | | Calculated Peak Hourly Flow (gal/hour) | | | Calculated Peak Hourly Flow (gal/hour) | | |

### Service Hot Water Pumps

| Model Input Parameter | Baseline Case | Proposed Case |
|---|---|---|
| Helpful Notes: | •Service hot water pumps should be modeled identically between the Proposed and Baseline case<br>•Any credit for improved service hot water pumps must be submitted using the Exceptional Calculation Method | Service hot water pumps modeled as designed (or installed) |
| Number of Pumps | | |
| Total Pump Power (kW) | | |
| Type of Pump (Constant/Variable) | | |
| Pump Control | | |

**Additional notes:**

## Table 1.4.6 - General HVAC

***Instructions:*** *Complete the Special Circumstances section, the Proposed and Baseline HVAC System Type(s) tables, and the HVAC Modeling Requirements checklist below. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Special Circumstances

| | Yes | No |
|---|---|---|
| Is the project building connected to a district or campus thermal energy system where thermal energy is produced for or distributed to multiple buildings? | ☐ | ☐ |

| | |
|---|---|
| The district energy system includes (check all that apply): | ☐ District Cooling ☐ District Heating ☐ CHP |
| Select how the district energy system has been modeled:<br>*Note: "DES v2" refers to the document "Treatment of District or Campus Thermal Energy in LEED V2 and LEED 2009 – Design & Construction" dated August 10, 2010, which can be accessed at http://www.usgbc.org/ShowFile.aspx?DocumentID=7671* | ☐ ASHRAE 90.1-2007 Appendix G without Addenda<br>☐ ASHRAE 90.1-2007 Appendix G Addenda ai<br>☐ California Title-24 Baseline default efficiencies<br>☐ DES v2 Option 1 (Building Stand-Aone)<br>☐ DES v2 Option 2 (Aggregate Building/DES) |
| For DES v2 Option 2, identify the method for evaluating the district plant average efficiency. | ☐ Modeling Method ☐ Monitoring Method |

| | |
|---|---|
| Please indicate all relevant equipment located on the project site: | ☐ Chillers ☐ Cooling Towers / Fluid Coolers ☐ Boilers for Space Heating / Backup Heat<br>☐ Ground Source / Geothermal Heat Pump ☐ Combined Heat & Power (CHP) |

| | Yes | No |
|---|---|---|
| Does the project building include tenant or other unfinished spaces whose systems (HVAC, lighting, etc.) are not included in the project's scope of work? | ☐ | ☐ |

| | |
|---|---|
| Select how the unfinished spaces have been modeled: | ☐ All equipment in the unfinished spaces not included in the project scope of work has been modeled identically in the Baseline and Proposed case using the Baseline modeling requirements.<br>☐ Credit has been modeled in the Proposed case for energy efficiency measures that are specifically identified in signed tenant sales and lease agreements (LEED Core & Shell only. New Construction must be modeled |

### Proposed HVAC System Type(s)

| System Description | Spaces Modeled |
|---|---|
| Helpful Notes: •The HVAC system type and all related parameters, such as equipment capacities and efficiencies, must be modeled as designed (or installed) per Table G3.1#10(a&b)<br>•Where no heating system exists or has been designed, the classification is assumed to be electric and the heating system is modeled identically to the Baseline case per Table G3.1#10(c)<br>•Where no cooling system exists or has been designed, the cooling system is modeled identically to the Baseline case per Table G3.1#10(d) | |
| PTACs | Floor 1 |
| | Floor 2 |
| | Floor 3 |
| | Floor 4 |
| | Floor 5 |
| | Floor 6 |
| | Floor 7 |
| | Floor 8 |
| | Floor 9 |
| DOAS-1 | Undefined Zone |
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**Baseline HVAC System Type(s)**

| Model Input Parameter | Table G3.1.1A System Type (or Semiconditioned System Description) | G3.1.1 Exception (or Semiconditioned Capacity and Area) | Spaces Modeled |
|---|---|---|---|
| Helpful Notes: | •Refer to Section G3.1.1 and Table G3.1.1A (including footnotes) for Primary HVAC System selection | | |
| Primary HVAC System | - Room PTAC | | Floor 1 |
| Primary HVAC System | - Room PTAC | | Floor 2 |
| Primary HVAC System | - Room PTAC | | Floor 3 |
| Primary HVAC System | - Room PTAC | | Floor 4 |
| Primary HVAC System | - Room PTAC | | Floor 5 |
| Primary HVAC System | - Room PTAC | | Floor 6 |
| Primary HVAC System | - Room PTAC | | Floor 7 |
| Primary HVAC System | - Room PTAC | | Floor 8 |
| Primary HVAC System | - Room PTAC | | Floor 9 |
| Primary HVAC System | - Room PTAC | | Undefined Zone |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
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| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Primary HVAC System | - | | |
| Other HVAC System(s) | - | | |
| | - | | |

**HVAC Modeling Requirements**

***Instructions:*** *After completing the information above, click "Refresh Modeling Requirements" to the left. All Proposed and Baseline HVAC system types must be entered above to to generate the correct modeling requirements below. After clicking "Refresh Modeling Requirements", identify each item as "Yes" or "No", and provide a further description for any items marked as "No".*

| | | |
|---|---|---|
| **Proposed HVAC Requirements** | All ***Proposed*** HVAC systems and related parameters, such as equipment capacities, efficiencies, airflows, fans, etc. have been modeled as designed and are consistent with supporting documentation uploaded in LEED Online | Yes |
| | Each ***Proposed*** HVAC thermal zone has been modeled as a separate thermal block except as allowed by Table G3.1#7 | Yes |
| | All ***Proposed*** HVAC systems serving conditioned spaces have been modeled with heating and cooling as required by Table G3.1#1(b), with heating and/or cooling added as necessary identically to the Baseline case per Table G3.1#10(c&d) except where System types (9) or (10) have been modeled in accordance with Addendum dn | Yes |
| | All ***Proposed*** HVAC systems and related parameters can be modeled directly in the energy simulation program used | Yes |
| | All ***Proposed*** fan part-load efficiency curves for variable volume fans have been modeled identically to the Baseline curves for variable volume fans (if not, provide a description of the fan curves used in the space at the bottom of this table, and confirm that the proposed case curves are representative of the actual building design) | Yes |

***For each item entered as "No" above, describe the applicable ASHRAE 90.1 Appendix G exception(s)***

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-0 | | Standard System-1 | | Standard System-2 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 1,137 | kBtu/h | 373 | kBtu/h | 373 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 550 | kBtu/h | 99 | kBtu/h | 99 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 13,402 | cfm | 7,599 | cfm | 7,599 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 16,000 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 4.02 | kW | 2.28 | kW | 2.28 | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| Exhaust Fan Power | | 12.03 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 16.05 | kW | 2.28 | kW | 2.28 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 16.05 | kW | 2.28 | kW | 2.28 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-3 | | Standard System-4 | | Standard System-5 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 373 | kBtu/h | 373 | kBtu/h | 373 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 99 | kBtu/h | 99 | kBtu/h | 99 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 7,599 | cfm | 7,599 | cfm | 7,599 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 2,219 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| Exhaust Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 2.28 | kW | 2.28 | kW | 2.28 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | Room PTAC | | Room PTAC | | |
| System Designation(s) | Consistent with designations used in model | Standard System-6 | | Standard System-7 | | Standard System-8 | | |
| Number of Similar Systems | | 1 | | 1 | | 1 | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 373 | kBtu/h | 373 | kBtu/h | 422 | kBtu/h | |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 9.5 EER | | 9.5 EER | | 9.5 EER | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | n/a | | n/a | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 99 | kBtu/h | 99 | kBtu/h | 116 | kBtu/h | |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 2.92 COP | | 2.92 COP | | 2.92 COP | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | Constant Volume | | Constant Volume | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 7,599 | cfm | 7,599 | cfm | 8,916 | cfm | |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 2,219 | cfm | 2,219 | cfm | 2,219 | cfm | |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | No | | No | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | n/a | °F | n/a | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | Warmest Zone | | Warmest Zone | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply<br>•50% energy recovery effectiveness<br>•Bypass or control to permit economizer | None | | None | | None | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm<br>•Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| Exhaust Fan Power | | 0.00 | kW | 0.00 | kW | 0.00 | kW | |
| System Fan Power | | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 2.28 | kW | 2.28 | kW | 2.67 | kW | |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | 0.00 | bhp | 0.00 | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7A - Baseline Air-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project,*

**Note:** All Baseline systems must be identified in the General HVAC Tab in order to display the relevant Baseline

### Table 1.4.7A - Baseline Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | | Room PTAC | | | | | | |
| System Designation(s) | Consistent with designations used in model | Standard System-9 | | | | | | |
| Number of Similar Systems | | 1 | | | | | | |
| Total Cooling Capacity | Auto-sized with 15% oversizing per G3.1.2.2 | 0 | kBtu/h | | kBtu/h | | kBtu/h | 4,170 |
| *Table 6.8.1 Unitary Cooling Capacity Range | •Systems 1 & 2: Table 6.8.1D<br>•Systems 3, 5, & 6: Table 6.8.1A<br>•System 4: Table 6.8.1B<br>•Systems 7-10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Cooling Efficiency (EER or SEER) | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 11.9 EER | | | | | | |
| *Unitary Cooling Part-load Efficiency (if applicable) | Enter N/A if not applicable | n/a | | | | | | |
| Total Heating Capacity | Auto-sized with 25% oversizing per G3.1.2.2 | 0 | kBtu/h | | kBtu/h | | kBtu/h | 1,358 |
| *Table 6.8.1 Unitary Heating Capacity Range | •System 2: Table 6.8.1D<br>•Systems 3 & 9: Table 6.8.1E<br>•System 4: Table 6.8.1B<br>•Systems 1, 5-8, 10: N/A | | kBtu/h | | kBtu/h | | kBtu/h | |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 3.34 COP | | | | | | |
| *Fan Control | •Systems 1-4, 9 & 10: Constant Volume<br>•Systems 5-8: Variable Volume | Constant Volume | | | | | | |
| Supply Airflow | •Systems 1-8: Auto-sized based on 20°F ΔT<br>•Systems 9-10: Auto-sized based on 105°F SAT | 20 | cfm | | cfm | | cfm | 75,530 |
| Outdoor Airflow | •If DCV modeled in Proposed only: ASHRAE 62.1 minimum ventilation rates reported in IEQp1<br>•All other cases: identical to Proposed | 0 | cfm | | cfm | | cfm | 33,754 |
| Demand Control Ventilation | If required by Section 6.4.3.9 (spaces >500 sf with >40 people/1,000 sf) | No | | | | | | |
| *Economizer High-Limit Shutoff (°F) | •Systems 1, 2, 9 & 10: N, A<br>•Systems 3-8: as required by G3.1.2.6 & G3.1.2.7 by Climate Zone:<br>• Not Required - 1a, 1b, 2a, 3a, 4a<br>•75°F - 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7b, 8<br>•70°F - 5a, 6a, 7a | n/a | °F | | °F | | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | Systems 5-8: Supply air temperature reset of 5°F under minimum cooling load conditions per G3.1.3.12 (e.g. from 55 °F to 60 °F) | Warmest Zone | | | | | | |
| *Any individual systems with ≥5,000 cfm supply air and ≥70% outdoor air? | •Exhaust air energy recovery required for individual systems with ≥5,000 cfm supply air and ≥70% outdoor air per G3.1.2.10 unless any exceptions apply | None | | | | | | |
| *Exhaust Air Energy Recovery Effectiveness or G3.1.2.10 Exception Claimed | •50% energy recovery effectiveness<br>•Bypass or control to permit economizer | | | | | | | |
| Supply Fan Power | •Sum of fan power for all supply, return, relief, and exhaust fans cannot exceed G3.1.2.9 system fan power allowance calculated using supply cfm | 0.00 | kW | | kW | | kW | |
| Return/Relief Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.00 | kW | | kW | | kW | |
| Exhaust Fan Power | | 0.00 | kW | | kW | | kW | |
| System Fan Power | | 0.01 | kW | | kW | | kW | 34.7 |
| **Allowed Fan Power:** | These values are calculated based on, system type, any pressure adjustments listed below, the total supply volume, and the ASHRAE 90.1 fan motor efficiency associated with the fan bhp. | 0.01 | kW | | kW | | kW | 34.7 |
| * Total Table 6.5.3.1.1B Pressure Drop Adjustments (A). | | 0.00 | bhp | | bhp | | bhp | |
| **Pressure Drop Adjustments:** *(Systems 3 through 8)* | •For each pressure adjustment allowed, enter the Baseline cfm through each device ($CFM_D$) | cfm | in. w.c. | cfm | in. w.c. | cfm | in. w.c. | |
| * Fully ducted return and/or exhaust air systems | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Return and/or exhaust airflow control devices | only where modulated to maintain relative negative or positive space pressure (e.g. lab, operating room) | | | | | | | |
| * Exhaust filters, scrubbers, or other exhaust treatment | Adjustment = Pressure drop of device calculated at fan system design condition | | | | | | | |
| * Particulate Filtration Credit: MERV 9 through 12 | Adjustment = 0.5 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 13 through 15 | Adjustment = 0.9 in. w.c. | | | | | | | |
| * Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters | Adjustment = Pressure drop calculated at 2× clean filter pressure drop at fan system design condition | | | | | | | |
| * Carbon and other gas-phase air cleaners | Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Heat recovery device | •only if modeled in Baseline per G3.1.2.10<br>•Adjustment = Pressure drop of device at fan system design condition | | | | | | | |
| * Evaporative humidifier/cooler in series with another cooling coil | •only if modeled in Baseline<br>• Adjustment = Clean filter pressure drop at fan system design condition | | | | | | | |
| * Sound Attenuation Section | Adjustment = 0.15 in. w.c. | | | | | | | |
| * Fume Hood Exhaust Exception | required if 6.5.3.1.1 Exception [c] is taken | | | | | | | |
| * Non-mechanical cooling fan volume | For system types #9 and #10, if present in the proposed design, increases the baseline fan power allowance by 0.054 Watts/cfm. | | cfm | | cfm | | cfm | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.7B - Proposed Air-Side HVAC System Schedule

***Instructions:*** *Instructions: Enter all applicable input parameters for the Proposed air-side HVAC systems below. All systems included in the model should be entered. Each individual system may be entered separately, or multiple systems may be grouped together if all input parameters identified with an (*) are similar. The table is set up for two unique HVAC systems (or two groups of similar systems), and additional systems (or groups of similar systems) should be added as necessary using the Add a System button. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A".*

### Table 1.4.7B - Proposed Air-Side HVAC System Schedule

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *System Type | All inputs should be consistent with the Proposed energy model and the mechanical drawings and equipment schedules submitted in LEED Online | Room PTAC | | Packaged DX | | | | |
| System Designation(s) | | PTACs | | DOAS-1 | | | | |
| Number of Similar Systems | | 136 | | 1 | | | | |
| Total Cooling Capacity | | 18 | kBtu/h | 0 | kBtu/h | | kBtu/h | 2,448 |
| *Unitary Cooling Efficiency | Units should be consistent with the ASHRAE 90.1 minimum efficiency rating requirements for this system type | 10.0 EER | | 14.0 SEER / 1 | | | | |
| *Unitary Cooling Part-load Efficiency | Indicate the part-load efficiency. Also describe the method for modeling part-load curves if the energy simulation does not have default curves for this equipment type. Enter N/A if not applicable. | n/a | | n/a | | | | |
| Total Heating Capacity | All inputs should be consistent with the Proposed energy model and the mechanical drawings and equipment schedules submitted in LEED Online | 18 | kBtu/h | 80 | kBtu/h | | kBtu/h | 2,528 |
| *Unitary Heating Efficiency | List all relevant efficiencies (e.g. 3.2 COP at 47°F db/43°F wb, 2.0 COP at 17°F db/15°F wb outdoor air) | 3.41 HSPF | | 3.41 HSPF | | | | |
| *Fan Control | e.g. Variable Speed Fans, 3-speed ECM fans with automated controls, constant speed, etc. | Constant Volume | | Constant Volume | | | | |
| Supply Airflow | Inputs should be consistent with the mechanical drawings and equipment schedules submitted in LEED Online | 300 | cfm | 0 | cfm | | cfm | 40,800 |
| Outdoor Airflow | Actual minimum outdoor airflow rates consistent with Mechanical Schedule | 248 | cfm | 0 | cfm | | cfm | 33,754 |
| Demand Control Ventilation | Briefly describe how demand control ventilation was modeled | No | | No | | | | |
| *Economizer Control | Describe the type of economizer control and the high limit shutoff. Also indicate if the economizer controls are for less than 100% of the design supply air. | n/a | °F | n/a | °F | | °F | |

| Model Input Parameter | Helpful Notes | HVAC System / Group | | HVAC System / Group | | HVAC System / Group | | Totals |
|---|---|---|---|---|---|---|---|---|
| | | Description | Units | Description | Units | Description | Units | |
| *Supply Air Temperature Reset | e.g. - Supply air temperature reset from 55°F to 62°F based on worst case zone | Constant Temp | | Constant Temp | | | | |
| *Exhaust Air Energy Recovery | If the system includes energy recovery, describe the type of energy recovery and recovery effectiveness (example: enthalpy wheel - 75% effective). Otherwise, enter "N/A". | None | | None | | | | |
| Supply Fan Power | •Report exhaust fans not interlocked with HVAC operation (such as parking garage ventilation fans, or unconditioned electrical room exhaust fans), and exhaust fans not required in the calculations (such as fume hoods applying Exception 6.5.3.1.1, or kitchen hoods operating independently of the building HVAC system) in Table 1.4.4 | 0.11 | kW | 0.00 | kW | | kW | |
| Return/Relief Fan Power | | 0.00 | kW | 0.00 | kW | | kW | |
| Exhaust Fan Power | | 0.09 | kW | 0.00 | kW | | kW | |
| System Fan Power | | 0.20 | kW | 0.00 | kW | | kW | 27.3 |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |
| Other (Describe) | | | | | | | | |

***See Instructions above***

Table 1.4 - Air-Side HVAC System Schedule

## Table 1.4.8 - Water-Side HVAC System Schedule

***Instructions:*** *Enter all applicable input parameters for the Baseline and Proposed water-side HVAC systems below. All systems included in the model should be entered. An example of the expected level of detail has been provided for each input. Please refer to the Helpful Notes for information about Appendix G modeling protocol. For any information not applicable to the project, simply enter "N/A". If taking credit for a campus or district plant efficiency using the DES v2 Option 2 Guidance, please include all relevant information regarding the District Plant equipment in the Proposed Case. For projects using the DES v2 Option 2 Guidance Option 1, or ASHRAE 90.1 Addendum ai for district energy systems, it is recommended that the Proposed Case inputs be completed first, and the description for many Baseline Case inputs will be auto-generated based on the proposed case inputs. Baseline Helpful notes relevant to DES v2 Option 1 and ASHRAE 90.1 Addendum ai are abbreviated as "DESv2#1" and "ai" respectively.*

| | Model Input Parameter | Baseline Helpful Notes | Baseline Case | Units | Proposed Case | Units |
|---|---|---|---|---|---|---|
| Chilled Water | Number and Type of Chillers *(and capacity per chiller if more than one type or size of chiller)* | •***≤300 tons building peak:*** 1 water-cooled screw chiller<br>•***300-600 tons building peak:*** 2 equally-sized water-cooled screw chillers<br>•***≥600 tons building peak:*** At least 2 water-cooled centrifugal chillers (800 tons max per chiller) | | | | |
| | Total Chiller Capacity | Auto-sized with 15% oversizing (unless oversized at the system coil) per G3.1.2.2 | 0 | tons | 0 | tons |
| | Chiller Efficiency - Full Load | Per Table 6.8.1C efficiencies | | kW/Ton | | kW/Ton |
| | Chiller Efficiency - Part Load | | | | | |
| | Chilled Water (CHW) Supply Temp | 44°F per G3.1.3.8 | 44 | °F | 44 | °F |
| | CHW ΔT | 12°F per G3.1.3.8 | | °F | | °F |
| | CHW Supply Temp Reset Parameters | 44°F at outdoor temps 80°F and above, 54°F at outdoor temps 60°F and below, and ramped linearly between 44°F and 54°F at outdoor temps between 80°F and 60°F per G3.1.3.9 | not a DOE-2 capability | | not a DOE-2 capability | |
| | CHW Loop Configuration | Primary/secondary per G3.1.3.10 | Primary Only | | Primary Only | |
| | Number of Primary CHW Pumps | 1 per chiller per G3.1.3.11 | 0 | # | 0 | # |
| | Primary CHW Pump Power | 22 W/gpm per G3.1.3.10 | | W/gpm | | W/gpm |
| | Primary CHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CHW temperatures | | gpm | | gpm |
| | Primary CHW Pump Control | Constant Flow - each primary pump interlocked to operate with associated chiller - G3.1.3.10, G3.1.3.11 | Constant Flow | | Constant Flow | |
| | Number of Secondary CHW Pumps | 1 per G3.1.3.10 | | # | 1 | # |
| | Secondary CHW Pump Power | 22 W/gpm per G3.1.3.10 | | W/gpm | 0.00 | W/gpm |
| | Secondary CHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CHW temperatures | | gpm | 0 | gpm |

| | Model Input Parameter | Baseline Helpful Notes | Baseline Case | Units | Proposed Case | Units |
|---|---|---|---|---|---|---|
| | Secondary CHW Pump Control | ***<300 tons:*** riding the pump curve<br>***≥300 tons:*** variable speed | | | One-Speed / 3 Way Valves | |
| | Water-Side Economizer | Not required | No | | No | |
| | Water-Side Energy Recovery | Not required | | | | |
| Cooling Tower & Condenser Water | Number of Cooling Towers / Fluid Coolers | 1 per G3.1.3.11 | 0 | # | 0 | # |
| | Cooling Tower Fan Power | Minimum 38.2 gpm/hp (maximum 0.0262 hp/gpm or 19.5 W/gpm) per Table 6.8.1G | | gpm/Hp | | gpm/Hp |
| | Cooling Tower Fan Control | Two-speed axial fans per G3.1.3.11 | | | | |
| | Condenser Water (CW) Leaving Temp | 85°F or 10°F approaching design wet-bulb temperature, whichever is lower per G3.1.3.11 | | °F | | °F |
| | CW ΔT | 10°F per G3.1.3.11 | | °F | | °F |
| | CW Loop Temp Reset Parameters | Maintain a 70°F leaving water temperature where weather permits, floating up to leaving water temperature at design conditions per G3.1.3.11 | | | | |
| | Number of CW Pumps | 1 per chiller per G3.1.3.11 | 0 | # | 0 | # |
| | CW Pump Power | 19 W/gpm per G3.1.3.11 | | W/gpm | | W/gpm |
| | CW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on CW temperatures | | gpm | | gpm |
| | CW Pump Control | Riding the pump curve per G3.1.3.11 | | | | |
| Hot Water / Steam | Number and Type of Boilers | ***≤15,000 sf:*** 1 natural draft hot water boiler<br>***>15,000 sf:*** 2 equally-sized natural draft hot water boilers staged as required by the load | | | | |
| | Total Boiler Capacity | Auto-sized with 25% oversizing (unless oversized at the system coil) per G3.1.2.2 | | | | |
| | Boiler Efficiency | Per Table 6.8.1F minimum efficiencies | | | | |
| | Hot Water or Steam (HHW) Supply Temp | 180°F per G3.1.3.3 | | °F | | °F |
| | HHW ΔT | 50°F per G3.1.3.3 | | °F | | °F |
| | HHW Temp Reset Parameters | 180°F at outdoor temps 20°F and below, 150°F at outdoor temps 50°F and above, and ramped linearly between 180°F and 150°F at outdoor temps between 20°F and 50°F per G3.1.3.4 | | | Primary Only | |
| | HHW Loop Configuration | Primary-only per G3.1.3.5 | | | 1 | |
| | Number of Primary HHW Pumps | One pump per Boiler | | # | 0 | # |
| | Primary HHW Pump Power | 19 W/gpm per G3.1.3.5 | | W/gpm | 0 | W/gpm |
| | Primary HHW Pump Flow | Auto-sized with a capacity ratio of 1.0 based on HHW temperatures | | gpm | One-Speed / 3 Way Valves | gpm |
| | Primary HHW Pump Control | ***<120,000 sf:*** riding the pump curve<br>***≥120,000 sf:*** variable speed | | | | |

# NIST BLCC 5.3-21: Cash Flow Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

## General Information

| | |
|---|---|
| File Name: | C:\Users\pereiraj\Desktop\Active Projects\T4511 Courtney Tower\Courtney T4511_LCCA.xml |
| Date of Study: | Wed May 31 11:19:38 EDT 2023 |
| Analysis Type: | FEMP Analysis, Energy Project |
| Project Name: | Courtney T4511 |
| Project Location: | District of Columbia |
| Analyst: | EXP |
| Base Date: | February 1, 2023 |
| Service Date: | February 1, 2024 |
| Study Period: | 40 years 0 months (February 1, 2023 through January 31, 2063) |

End-of-year cash-flow convention used

All costs in constant dollars (excluding general inflation)

# Alternative: Proposed Case

## Initial Capital Costs

### Component: Mini-split heat pumps, DOAS

| Year Beginning | Total |
|---|---|
| Feb 2023 | $9,038,720 |
| Total | $9,038,720 |

## Capital Investment Costs

| Year Beginning | Initial | Replacement | Total |
|---|---|---|---|
| Feb 2023 | $9,038,720 | $0 | $9,038,720 |
| Feb 2024 | $0 | $0 | $0 |
| Feb 2025 | $0 | $0 | $0 |
| Feb 2026 | $0 | $0 | $0 |
| Feb 2027 | $0 | $0 | $0 |
| Feb 2028 | $0 | $0 | $0 |
| Feb 2029 | $0 | $0 | $0 |
| Feb 2030 | $0 | $0 | $0 |
| Feb 2031 | $0 | $0 | $0 |
| Feb 2032 | $0 | $0 | $0 |
| Feb 2033 | $0 | $0 | $0 |
| Feb 2034 | $0 | $0 | $0 |
| Feb 2035 | $0 | $0 | $0 |

| | | | |
|---|---|---|---|
| Feb 2036 | $0 | $0 | $0 |
| Feb 2037 | $0 | $0 | $0 |
| Feb 2038 | $0 | $0 | $0 |
| Feb 2039 | $0 | $0 | $0 |
| Feb 2040 | $0 | $0 | $0 |
| Feb 2041 | $0 | $0 | $0 |
| Feb 2042 | $0 | $0 | $0 |
| Feb 2043 | $0 | $0 | $0 |
| Feb 2044 | $0 | $2,259,680 | $2,259,680 |
| Feb 2045 | $0 | $0 | $0 |
| Feb 2046 | $0 | $0 | $0 |
| Feb 2047 | $0 | $0 | $0 |
| Feb 2048 | $0 | $0 | $0 |
| Feb 2049 | $0 | $0 | $0 |
| Feb 2050 | $0 | $0 | $0 |
| Feb 2051 | $0 | $0 | $0 |
| Feb 2052 | $0 | $0 | $0 |
| Feb 2053 | $0 | $0 | $0 |
| Feb 2054 | $0 | $0 | $0 |
| Feb 2055 | $0 | $0 | $0 |
| Feb 2056 | $0 | $0 | $0 |
| Feb 2057 | $0 | $0 | $0 |
| Feb 2058 | $0 | $0 | $0 |
| Feb 2059 | $0 | $0 | $0 |
| Feb 2060 | $0 | $0 | $0 |
| Feb 2061 | $0 | $0 | $0 |
| Feb 2062 | $0 | $0 | $0 |
| **Total** | $9,038,720 | $2,259,680 | $11,298,400 |

## Operating-Related Costs

| Year Beginning | Energy Consumption | Energy Demand | Energy Rebate | Total |
|---|---|---|---|---|
| Feb 2023 | $0 | $0 | $0 | $0 |
| Feb 2024 | $353,386 | $0 | $0 | $353,386 |
| Feb 2025 | $352,722 | $0 | $0 | $352,722 |
| Feb 2026 | $353,038 | $0 | $0 | $353,038 |
| Feb 2027 | $352,992 | $0 | $0 | $352,992 |

| | | | | | |
|---|---|---|---|---|---|
| Feb 2028 | | $353,644 | $0 | $0 | $353,644 |
| Feb 2029 | | $353,439 | $0 | $0 | $353,439 |
| Feb 2030 | | $352,022 | $0 | $0 | $352,022 |
| Feb 2031 | | $349,618 | $0 | $0 | $349,618 |
| Feb 2032 | | $349,193 | $0 | $0 | $349,193 |
| Feb 2033 | | $348,855 | $0 | $0 | $348,855 |
| Feb 2034 | | $347,888 | $0 | $0 | $347,888 |
| Feb 2035 | | $346,136 | $0 | $0 | $346,136 |
| Feb 2036 | | $344,359 | $0 | $0 | $344,359 |
| Feb 2037 | | $342,383 | $0 | $0 | $342,383 |
| Feb 2038 | | $340,476 | $0 | $0 | $340,476 |
| Feb 2039 | | $338,817 | $0 | $0 | $338,817 |
| Feb 2040 | | $337,197 | $0 | $0 | $337,197 |
| Feb 2041 | | $335,919 | $0 | $0 | $335,919 |
| Feb 2042 | | $332,905 | $0 | $0 | $332,905 |
| Feb 2043 | | $330,891 | $0 | $0 | $330,891 |
| Feb 2044 | | $329,362 | $0 | $0 | $329,362 |
| Feb 2045 | | $326,980 | $0 | $0 | $326,980 |
| Feb 2046 | | $325,548 | $0 | $0 | $325,548 |
| Feb 2047 | | $324,111 | $0 | $0 | $324,111 |
| Feb 2048 | | $321,500 | $0 | $0 | $321,500 |
| Feb 2049 | | $318,447 | $0 | $0 | $318,447 |
| Feb 2050 | | $315,351 | $0 | $0 | $315,351 |
| Feb 2051 | | $312,928 | $0 | $0 | $312,928 |
| Feb 2052 | | $310,644 | $0 | $0 | $310,644 |
| Feb 2053 | | $308,383 | $0 | $0 | $308,383 |
| Feb 2054 | | $306,138 | $0 | $0 | $306,138 |
| Feb 2055 | | $303,910 | $0 | $0 | $303,910 |
| Feb 2056 | | $301,692 | $0 | $0 | $301,692 |
| Feb 2057 | | $299,496 | $0 | $0 | $299,496 |
| Feb 2058 | | $297,316 | $0 | $0 | $297,316 |
| Feb 2059 | | $295,152 | $0 | $0 | $295,152 |
| Feb 2060 | | $292,998 | $0 | $0 | $292,998 |
| Feb 2061 | | $290,865 | $0 | $0 | $290,865 |
| Feb 2062 | | $288,754 | $0 | $0 | $288,754 |
| **Total** | 912HV26BA009 | $12,785,457 | $0 | $0 | $12,785,457 |

## Sum of All Cash Flows

| Year Beginning | Capital | OM&R | Total |
|---|---|---|---|
| Feb 2023 | $9,038,720 | $0 | $9,038,720 |
| Feb 2024 | $0 | $353,386 | $353,386 |
| Feb 2025 | $0 | $352,722 | $352,722 |
| Feb 2026 | $0 | $353,038 | $353,038 |
| Feb 2027 | $0 | $352,992 | $352,992 |
| Feb 2028 | $0 | $353,644 | $353,644 |
| Feb 2029 | $0 | $353,439 | $353,439 |
| Feb 2030 | $0 | $352,022 | $352,022 |
| Feb 2031 | $0 | $349,618 | $349,618 |
| Feb 2032 | $0 | $349,193 | $349,193 |
| Feb 2033 | $0 | $348,855 | $348,855 |
| Feb 2034 | $0 | $347,888 | $347,888 |
| Feb 2035 | $0 | $346,136 | $346,136 |
| Feb 2036 | $0 | $344,359 | $344,359 |
| Feb 2037 | $0 | $342,383 | $342,383 |
| Feb 2038 | $0 | $340,476 | $340,476 |
| Feb 2039 | $0 | $338,817 | $338,817 |
| Feb 2040 | $0 | $337,197 | $337,197 |
| Feb 2041 | $0 | $335,919 | $335,919 |
| Feb 2042 | $0 | $332,905 | $332,905 |
| Feb 2043 | $0 | $330,891 | $330,891 |
| Feb 2044 | $2,259,680 | $329,362 | $2,589,042 |
| Feb 2045 | $0 | $326,980 | $326,980 |
| Feb 2046 | $0 | $325,548 | $325,548 |
| Feb 2047 | $0 | $324,111 | $324,111 |
| Feb 2048 | $0 | $321,500 | $321,500 |
| Feb 2049 | $0 | $318,447 | $318,447 |
| Feb 2050 | $0 | $315,351 | $315,351 |
| Feb 2051 | $0 | $312,928 | $312,928 |
| Feb 2052 | $0 | $310,644 | $310,644 |
| Feb 2053 | $0 | $308,383 | $308,383 |
| Feb 2054 | $0 | $306,138 | $306,138 |
| Feb 2055 | $0 | $303,910 | $303,910 |
| Feb 2056 | $0 | $301,692 | $301,692 |
| Feb 2057 | $0 | $299,496 | $299,496 |

| | | | |
|---|---|---|---|
| Feb 2057 | $0 | $299,496 | $299,496 |
| Feb 2058 | $0 | $297,316 | $297,316 |
| Feb 2059 | $0 | $295,152 | $295,152 |
| Feb 2060 | $0 | $292,998 | $292,998 |
| Feb 2061 | $0 | $290,865 | $290,865 |
| Feb 2062 | $0 | $288,754 | $288,754 |
| **Total** | $11,298,400 | $12,785,457 | $24,083,857 |

# Alternative: ECM 1

## Initial Capital Costs

### Component: DOAS w/ FCUs and Air Cooled Chiller

| Year Beginning | Total |
|---|---|
| Feb 2023 | $13,203,080 |
| Total | $13,203,080 |

## Capital Investment Costs

| Year Beginning | Initial | Replacement | Total |
|---|---|---|---|
| Feb 2023 | $13,203,080 | $0 | $13,203,080 |
| Feb 2024 | $0 | $0 | $0 |
| Feb 2025 | $0 | $0 | $0 |
| Feb 2026 | $0 | $0 | $0 |
| Feb 2027 | $0 | $0 | $0 |
| Feb 2028 | $0 | $0 | $0 |
| Feb 2029 | $0 | $0 | $0 |
| Feb 2030 | $0 | $0 | $0 |
| Feb 2031 | $0 | $0 | $0 |
| Feb 2032 | $0 | $0 | $0 |
| Feb 2033 | $0 | $0 | $0 |
| Feb 2034 | $0 | $0 | $0 |
| Feb 2035 | $0 | $0 | $0 |
| Feb 2036 | $0 | $0 | $0 |
| Feb 2037 | $0 | $0 | $0 |
| Feb 2038 | $0 | $0 | $0 |
| Feb 2039 | $0 | $0 | $0 |
| Feb 2040 | $0 | $0 | $0 |
| Feb 2041 | $0 | $0 | $0 |
| Feb 2042 | $0 | $0 | $0 |
| Feb 2043 | $0 | $0 | $0 |

| | | | |
|---|---|---|---|
| Feb 2043 | $0 | $0 | $0 |
| Feb 2044 | $0 | $3,300,770 | $3,300,770 |
| Feb 2045 | $0 | $0 | $0 |
| Feb 2046 | $0 | $0 | $0 |
| Feb 2047 | $0 | $0 | $0 |
| Feb 2048 | $0 | $0 | $0 |
| Feb 2049 | $0 | $0 | $0 |
| Feb 2050 | $0 | $0 | $0 |
| Feb 2051 | $0 | $0 | $0 |
| Feb 2052 | $0 | $0 | $0 |
| Feb 2053 | $0 | $0 | $0 |
| Feb 2054 | $0 | $0 | $0 |
| Feb 2055 | $0 | $0 | $0 |
| Feb 2056 | $0 | $0 | $0 |
| Feb 2057 | $0 | $0 | $0 |
| Feb 2058 | $0 | $0 | $0 |
| Feb 2059 | $0 | $0 | $0 |
| Feb 2060 | $0 | $0 | $0 |
| Feb 2061 | $0 | $0 | $0 |
| Feb 2062 | $0 | $0 | $0 |
| **Total** | $13,203,080 | $3,300,770 | $16,503,850 |

## Operating-Related Costs

| Year Beginning | Energy Consumption | Energy Demand | Energy Rebate | Total |
|---|---|---|---|---|
| Feb 2023 | $0 | $0 | $0 | $0 |
| Feb 2024 | $376,710 | $0 | $0 | $376,710 |
| Feb 2025 | $376,003 | $0 | $0 | $376,003 |
| Feb 2026 | $376,339 | $0 | $0 | $376,339 |
| Feb 2027 | $376,290 | $0 | $0 | $376,290 |
| Feb 2028 | $376,985 | $0 | $0 | $376,985 |
| Feb 2029 | $376,767 | $0 | $0 | $376,767 |
| Feb 2030 | $375,257 | $0 | $0 | $375,257 |
| Feb 2031 | $372,694 | $0 | $0 | $372,694 |
| Feb 2032 | $372,240 | $0 | $0 | $372,240 |
| Feb 2033 | $371,880 | $0 | $0 | $371,880 |
| Feb 2034 | $370,850 | $0 | $0 | $370,850 |
| Feb 2035 | $368,982 | $0 | $0 | $368,982 |

| | | | | |
|---|---|---|---|---|
| Feb 2036 | $367,087 | $0 | $0 | $367,087 |
| Feb 2037 | $364,981 | $0 | $0 | $364,981 |
| Feb 2038 | $362,949 | $0 | $0 | $362,949 |
| Feb 2039 | $361,179 | $0 | $0 | $361,179 |
| Feb 2040 | $359,453 | $0 | $0 | $359,453 |
| Feb 2041 | $358,090 | $0 | $0 | $358,090 |
| Feb 2042 | $354,878 | $0 | $0 | $354,878 |
| Feb 2043 | $352,731 | $0 | $0 | $352,731 |
| Feb 2044 | $351,100 | $0 | $0 | $351,100 |
| Feb 2045 | $348,561 | $0 | $0 | $348,561 |
| Feb 2046 | $347,035 | $0 | $0 | $347,035 |
| Feb 2047 | $345,503 | $0 | $0 | $345,503 |
| Feb 2048 | $342,720 | $0 | $0 | $342,720 |
| Feb 2049 | $339,465 | $0 | $0 | $339,465 |
| Feb 2050 | $336,165 | $0 | $0 | $336,165 |
| Feb 2051 | $333,582 | $0 | $0 | $333,582 |
| Feb 2052 | $331,147 | $0 | $0 | $331,147 |
| Feb 2053 | $328,737 | $0 | $0 | $328,737 |
| Feb 2054 | $326,344 | $0 | $0 | $326,344 |
| Feb 2055 | $323,969 | $0 | $0 | $323,969 |
| Feb 2056 | $321,604 | $0 | $0 | $321,604 |
| Feb 2057 | $319,264 | $0 | $0 | $319,264 |
| Feb 2058 | $316,940 | $0 | $0 | $316,940 |
| Feb 2059 | $314,633 | $0 | $0 | $314,633 |
| Feb 2060 | $312,337 | $0 | $0 | $312,337 |
| Feb 2061 | $310,063 | $0 | $0 | $310,063 |
| Feb 2062 | $307,813 | $0 | $0 | $307,813 |
| **Total** | $13,629,325 | $0 | $0 | $13,629,325 |

## Sum of All Cash Flows

| Year Beginning | Capital | OM&R | Total |
|---|---|---|---|
| Feb 2023 | $13,203,080 | $0 | $13,203,080 |
| Feb 2024 | $0 | $376,710 | $376,710 |
| Feb 2025 | $0 | $376,003 | $376,003 |
| Feb 2026 | $0 | $376,339 | $376,339 |
| Feb 2027 | $0 | $376,290 | $376,290 |

| | | | |
|---|---|---|---|
| Feb 2028 | $0 | $376,985 | $376,985 |
| Feb 2029 | $0 | $376,767 | $376,767 |
| Feb 2030 | $0 | $375,257 | $375,257 |
| Feb 2031 | $0 | $372,694 | $372,694 |
| Feb 2032 | $0 | $372,240 | $372,240 |
| Feb 2033 | $0 | $371,880 | $371,880 |
| Feb 2034 | $0 | $370,850 | $370,850 |
| Feb 2035 | $0 | $368,982 | $368,982 |
| Feb 2036 | $0 | $367,087 | $367,087 |
| Feb 2037 | $0 | $364,981 | $364,981 |
| Feb 2038 | $0 | $362,949 | $362,949 |
| Feb 2039 | $0 | $361,179 | $361,179 |
| Feb 2040 | $0 | $359,453 | $359,453 |
| Feb 2041 | $0 | $358,090 | $358,090 |
| Feb 2042 | $0 | $354,878 | $354,878 |
| Feb 2043 | $0 | $352,731 | $352,731 |
| Feb 2044 | $3,300,770 | $351,100 | $3,651,870 |
| Feb 2045 | $0 | $348,561 | $348,561 |
| Feb 2046 | $0 | $347,035 | $347,035 |
| Feb 2047 | $0 | $345,503 | $345,503 |
| Feb 2048 | $0 | $342,720 | $342,720 |
| Feb 2049 | $0 | $339,465 | $339,465 |
| Feb 2050 | $0 | $336,165 | $336,165 |
| Feb 2051 | $0 | $333,582 | $333,582 |
| Feb 2052 | $0 | $331,147 | $331,147 |
| Feb 2053 | $0 | $328,737 | $328,737 |
| Feb 2054 | $0 | $326,344 | $326,344 |
| Feb 2055 | $0 | $323,969 | $323,969 |
| Feb 2056 | $0 | $321,604 | $321,604 |
| Feb 2057 | $0 | $319,264 | $319,264 |
| Feb 2058 | $0 | $316,940 | $316,940 |
| Feb 2059 | $0 | $314,633 | $314,633 |
| Feb 2060 | $0 | $312,337 | $312,337 |
| Feb 2061 | $0 | $310,063 | $310,063 |
| Feb 2062 | $0 | $307,813 | $307,813 |
| **Total** | $16,503,850 | $13,629,325 | $30,133,175 |

# Alternative: ECM2

## Initial Capital Costs

### Component: AHUs w/ VAVs

| Year Beginning | Total |
|---|---|
| Feb 2023 | $7,288,600 |
| Total | $7,288,600 |

## Capital Investment Costs

| Year Beginning | Initial | Replacement | Total |
|---|---|---|---|
| Feb 2023 | $7,288,600 | $0 | $7,288,600 |
| Feb 2024 | $0 | $0 | $0 |
| Feb 2025 | $0 | $0 | $0 |
| Feb 2026 | $0 | $0 | $0 |
| Feb 2027 | $0 | $0 | $0 |
| Feb 2028 | $0 | $0 | $0 |
| Feb 2029 | $0 | $0 | $0 |
| Feb 2030 | $0 | $0 | $0 |
| Feb 2031 | $0 | $0 | $0 |
| Feb 2032 | $0 | $0 | $0 |
| Feb 2033 | $0 | $0 | $0 |
| Feb 2034 | $0 | $5,466,450 | $5,466,450 |
| Feb 2035 | $0 | $0 | $0 |
| Feb 2036 | $0 | $0 | $0 |
| Feb 2037 | $0 | $0 | $0 |
| Feb 2038 | $0 | $0 | $0 |
| Feb 2039 | $0 | $0 | $0 |
| Feb 2040 | $0 | $0 | $0 |
| Feb 2041 | $0 | $0 | $0 |
| Feb 2042 | $0 | $0 | $0 |
| Feb 2043 | $0 | $0 | $0 |
| Feb 2044 | $0 | $0 | $0 |
| Feb 2045 | $0 | $0 | $0 |
| Feb 2046 | $0 | $0 | $0 |
| Feb 2047 | $0 | $0 | $0 |
| Feb 2048 | $0 | $0 | $0 |
| Feb 2049 | $0 | $0 | $0 |
| Feb 2050 | $0 | $0 | $0 |

| | | | |
|---|---|---|---|
| Feb 2051 | $0 | $0 | $0 |
| Feb 2052 | $0 | $0 | $0 |
| Feb 2053 | $0 | $0 | $0 |
| Feb 2054 | $0 | $0 | $0 |
| Feb 2055 | $0 | $0 | $0 |
| Feb 2056 | $0 | $0 | $0 |
| Feb 2057 | $0 | $0 | $0 |
| Feb 2058 | $0 | $0 | $0 |
| Feb 2059 | $0 | $0 | $0 |
| Feb 2060 | $0 | $0 | $0 |
| Feb 2061 | $0 | $0 | $0 |
| Feb 2062 | $0 | $0 | $0 |
| **Total** | $7,288,600 | $5,466,450 | $12,755,050 |

## Operating-Related Costs

| Year Beginning | Energy Consumption | Energy Demand | Energy Rebate | Total |
|---|---|---|---|---|
| Feb 2023 | $0 | $0 | $0 | $0 |
| Feb 2024 | $392,991 | $0 | $0 | $392,991 |
| Feb 2025 | $392,254 | $0 | $0 | $392,254 |
| Feb 2026 | $392,605 | $0 | $0 | $392,605 |
| Feb 2027 | $392,553 | $0 | $0 | $392,553 |
| Feb 2028 | $393,279 | $0 | $0 | $393,279 |
| Feb 2029 | $393,051 | $0 | $0 | $393,051 |
| Feb 2030 | $391,475 | $0 | $0 | $391,475 |
| Feb 2031 | $388,802 | $0 | $0 | $388,802 |
| Feb 2032 | $388,328 | $0 | $0 | $388,328 |
| Feb 2033 | $387,953 | $0 | $0 | $387,953 |
| Feb 2034 | $386,878 | $0 | $0 | $386,878 |
| Feb 2035 | $384,929 | $0 | $0 | $384,929 |
| Feb 2036 | $382,952 | $0 | $0 | $382,952 |
| Feb 2037 | $380,756 | $0 | $0 | $380,756 |
| Feb 2038 | $378,635 | $0 | $0 | $378,635 |
| Feb 2039 | $376,790 | $0 | $0 | $376,790 |
| Feb 2040 | $374,988 | $0 | $0 | $374,988 |
| Feb 2041 | $373,567 | $0 | $0 | $373,567 |
| Feb 2042 | $370,216 | $0 | $0 | $370,216 |

| | | | | |
|---|---|---|---|---|
| Feb 2043 | $367,976 | $0 | $0 | $367,976 |
| Feb 2044 | $366,275 | $0 | $0 | $366,275 |
| Feb 2045 | $363,626 | $0 | $0 | $363,626 |
| Feb 2046 | $362,034 | $0 | $0 | $362,034 |
| Feb 2047 | $360,436 | $0 | $0 | $360,436 |
| Feb 2048 | $357,532 | $0 | $0 | $357,532 |
| Feb 2049 | $354,137 | $0 | $0 | $354,137 |
| Feb 2050 | $350,694 | $0 | $0 | $350,694 |
| Feb 2051 | $347,999 | $0 | $0 | $347,999 |
| Feb 2052 | $345,459 | $0 | $0 | $345,459 |
| Feb 2053 | $342,945 | $0 | $0 | $342,945 |
| Feb 2054 | $340,449 | $0 | $0 | $340,449 |
| Feb 2055 | $337,971 | $0 | $0 | $337,971 |
| Feb 2056 | $335,504 | $0 | $0 | $335,504 |
| Feb 2057 | $333,062 | $0 | $0 | $333,062 |
| Feb 2058 | $330,638 | $0 | $0 | $330,638 |
| Feb 2059 | $328,231 | $0 | $0 | $328,231 |
| Feb 2060 | $325,836 | $0 | $0 | $325,836 |
| Feb 2061 | $323,464 | $0 | $0 | $323,464 |
| Feb 2062 | $321,116 | $0 | $0 | $321,116 |
| **Total** | $14,218,386 | $0 | $0 | $14,218,386 |

## Sum of All Cash Flows

| Year Beginning | Capital | OM&R | Total |
|---|---|---|---|
| Feb 2023 | $7,288,600 | $0 | $7,288,600 |
| Feb 2024 | $0 | $392,991 | $392,991 |
| Feb 2025 | $0 | $392,254 | $392,254 |
| Feb 2026 | $0 | $392,605 | $392,605 |
| Feb 2027 | $0 | $392,553 | $392,553 |
| Feb 2028 | $0 | $393,279 | $393,279 |
| Feb 2029 | $0 | $393,051 | $393,051 |
| Feb 2030 | $0 | $391,475 | $391,475 |
| Feb 2031 | $0 | $388,802 | $388,802 |
| Feb 2032 | $0 | $388,328 | $388,328 |
| Feb 2033 | $0 | $387,953 | $387,953 |
| Feb 2034 | $5,466,450 | $386,878 | $5,853,328 |

| | | | |
|---|---|---|---|
| Feb 2035 | $0 | $384,929 | $384,929 |
| Feb 2036 | $0 | $382,952 | $382,952 |
| Feb 2037 | $0 | $380,756 | $380,756 |
| Feb 2038 | $0 | $378,635 | $378,635 |
| Feb 2039 | $0 | $376,790 | $376,790 |
| Feb 2040 | $0 | $374,988 | $374,988 |
| Feb 2041 | $0 | $373,567 | $373,567 |
| Feb 2042 | $0 | $370,216 | $370,216 |
| Feb 2043 | $0 | $367,976 | $367,976 |
| Feb 2044 | $0 | $366,275 | $366,275 |
| Feb 2045 | $0 | $363,626 | $363,626 |
| Feb 2046 | $0 | $362,034 | $362,034 |
| Feb 2047 | $0 | $360,436 | $360,436 |
| Feb 2048 | $0 | $357,532 | $357,532 |
| Feb 2049 | $0 | $354,137 | $354,137 |
| Feb 2050 | $0 | $350,694 | $350,694 |
| Feb 2051 | $0 | $347,999 | $347,999 |
| Feb 2052 | $0 | $345,459 | $345,459 |
| Feb 2053 | $0 | $342,945 | $342,945 |
| Feb 2054 | $0 | $340,449 | $340,449 |
| Feb 2055 | $0 | $337,971 | $337,971 |
| Feb 2056 | $0 | $335,504 | $335,504 |
| Feb 2057 | $0 | $333,062 | $333,062 |
| Feb 2058 | $0 | $330,638 | $330,638 |
| Feb 2059 | $0 | $328,231 | $328,231 |
| Feb 2060 | $0 | $325,836 | $325,836 |
| Feb 2061 | $0 | $323,464 | $323,464 |
| Feb 2062 | $0 | $321,116 | $321,116 |
| **Total** | $12,755,050 | $14,218,386 | $26,973,436 |

# Alternative: Base Case

## Initial Capital Costs

### Component: Copy of: AHUs w/ VAVs

| Year Beginning | Total |
|---|---|
| Feb 2023 | $5,830,880 |
| Total | $5,830,880 |

## Capital Investment Costs



| Year Beginning | Initial | Replacement | Total |
|---|---|---|---|
| Feb 2023 | $5,830,880 | $0 | $5,830,880 |
| Feb 2024 | $0 | $0 | $0 |
| Feb 2025 | $0 | $0 | $0 |
| Feb 2026 | $0 | $0 | $0 |
| Feb 2027 | $0 | $0 | $0 |
| Feb 2028 | $0 | $0 | $0 |
| Feb 2029 | $0 | $0 | $0 |
| Feb 2030 | $0 | $0 | $0 |
| Feb 2031 | $0 | $0 | $0 |
| Feb 2032 | $0 | $0 | $0 |
| Feb 2033 | $0 | $0 | $0 |
| Feb 2034 | $0 | $4,373,160 | $4,373,160 |
| Feb 2035 | $0 | $0 | $0 |
| Feb 2036 | $0 | $0 | $0 |
| Feb 2037 | $0 | $0 | $0 |
| Feb 2038 | $0 | $0 | $0 |
| Feb 2039 | $0 | $0 | $0 |
| Feb 2040 | $0 | $0 | $0 |
| Feb 2041 | $0 | $0 | $0 |
| Feb 2042 | $0 | $0 | $0 |
| Feb 2043 | $0 | $0 | $0 |
| Feb 2044 | $0 | $0 | $0 |
| Feb 2045 | $0 | $0 | $0 |
| Feb 2046 | $0 | $0 | $0 |
| Feb 2047 | $0 | $0 | $0 |
| Feb 2048 | $0 | $0 | $0 |
| Feb 2049 | $0 | $0 | $0 |
| Feb 2050 | $0 | $0 | $0 |
| Feb 2051 | $0 | $0 | $0 |
| Feb 2052 | $0 | $0 | $0 |
| Feb 2053 | $0 | $0 | $0 |
| Feb 2054 | $0 | $0 | $0 |
| Feb 2055 | $0 | $0 | $0 |
| Feb 2056 | $0 | $0 | $0 |
| Feb 2057 | $0 | $0 | $0 |

| | | | |
|---|---|---|---|
| Feb 2058 | $0 | $0 | $0 |
| Feb 2059 | $0 | $0 | $0 |
| Feb 2060 | $0 | $0 | $0 |
| Feb 2061 | $0 | $0 | $0 |
| Feb 2062 | $0 | $0 | $0 |
| **Total** | $5,830,880 | $4,373,160 | $10,204,040 |

## Operating-Related Costs

| Year Beginning | Energy Consumption | Energy Demand | Energy Rebate | Total |
|---|---|---|---|---|
| Feb 2023 | $0 | $0 | $0 | $0 |
| Feb 2024 | $393,481 | $0 | $0 | $393,481 |
| Feb 2025 | $396,429 | $0 | $0 | $396,429 |
| Feb 2026 | $399,126 | $0 | $0 | $399,126 |
| Feb 2027 | $401,022 | $0 | $0 | $401,022 |
| Feb 2028 | $403,509 | $0 | $0 | $403,509 |
| Feb 2029 | $405,031 | $0 | $0 | $405,031 |
| Feb 2030 | $405,360 | $0 | $0 | $405,360 |
| Feb 2031 | $405,039 | $0 | $0 | $405,039 |
| Feb 2032 | $406,257 | $0 | $0 | $406,257 |
| Feb 2033 | $407,342 | $0 | $0 | $407,342 |
| Feb 2034 | $408,011 | $0 | $0 | $408,011 |
| Feb 2035 | $407,837 | $0 | $0 | $407,837 |
| Feb 2036 | $407,575 | $0 | $0 | $407,575 |
| Feb 2037 | $407,324 | $0 | $0 | $407,324 |
| Feb 2038 | $407,009 | $0 | $0 | $407,009 |
| Feb 2039 | $406,685 | $0 | $0 | $406,685 |
| Feb 2040 | $406,360 | $0 | $0 | $406,360 |
| Feb 2041 | $406,232 | $0 | $0 | $406,232 |
| Feb 2042 | $404,966 | $0 | $0 | $404,966 |
| Feb 2043 | $404,256 | $0 | $0 | $404,256 |
| Feb 2044 | $404,086 | $0 | $0 | $404,086 |
| Feb 2045 | $403,342 | $0 | $0 | $403,342 |
| Feb 2046 | $403,381 | $0 | $0 | $403,381 |
| Feb 2047 | $403,469 | $0 | $0 | $403,469 |
| Feb 2048 | $403,004 | $0 | $0 | $403,004 |
| Feb 2049 | $402,306 | $0 | $0 | $402,306 |
| Feb 2050 | $401,453 | $0 | $0 | $401,453 |

| | | | | |
|---|---|---|---|---|
| Feb 2050 | $401,133 | $0 | $0 | $401,133 |
| Feb 2051 | $401,030 | $0 | $0 | $401,030 |
| Feb 2052 | $400,706 | $0 | $0 | $400,706 |
| Feb 2053 | $400,398 | $0 | $0 | $400,398 |
| Feb 2054 | $400,104 | $0 | $0 | $400,104 |
| Feb 2055 | $399,824 | $0 | $0 | $399,824 |
| Feb 2056 | $399,557 | $0 | $0 | $399,557 |
| Feb 2057 | $399,305 | $0 | $0 | $399,305 |
| Feb 2058 | $399,067 | $0 | $0 | $399,067 |
| Feb 2059 | $398,843 | $0 | $0 | $398,843 |
| Feb 2060 | $398,633 | $0 | $0 | $398,633 |
| Feb 2061 | $398,436 | $0 | $0 | $398,436 |
| Feb 2062 | $398,254 | $0 | $0 | $398,254 |
| **Total** | $15,704,048 | $0 | $0 | $15,704,048 |

## Sum of All Cash Flows

| Year Beginning | Capital | OM&R | Total |
|---|---|---|---|
| Feb 2023 | $5,830,880 | $0 | $5,830,880 |
| Feb 2024 | $0 | $393,481 | $393,481 |
| Feb 2025 | $0 | $396,429 | $396,429 |
| Feb 2026 | $0 | $399,126 | $399,126 |
| Feb 2027 | $0 | $401,022 | $401,022 |
| Feb 2028 | $0 | $403,509 | $403,509 |
| Feb 2029 | $0 | $405,031 | $405,031 |
| Feb 2030 | $0 | $405,360 | $405,360 |
| Feb 2031 | $0 | $405,039 | $405,039 |
| Feb 2032 | $0 | $406,257 | $406,257 |
| Feb 2033 | $0 | $407,342 | $407,342 |
| Feb 2034 | $4,373,160 | $408,011 | $4,781,171 |
| Feb 2035 | $0 | $407,837 | $407,837 |
| Feb 2036 | $0 | $407,575 | $407,575 |
| Feb 2037 | $0 | $407,324 | $407,324 |
| Feb 2038 | $0 | $407,009 | $407,009 |
| Feb 2039 | $0 | $406,685 | $406,685 |
| Feb 2040 | $0 | $406,360 | $406,360 |
| Feb 2041 | $0 | $406,232 | $406,232 |
| Feb 2042 | $0 | $404,966 | $404,966 |

| | | | |
|---|---|---|---|
| Feb 2043 | $0 | $404,256 | $404,256 |
| Feb 2044 | $0 | $404,086 | $404,086 |
| Feb 2045 | $0 | $403,342 | $403,342 |
| Feb 2046 | $0 | $403,381 | $403,381 |
| Feb 2047 | $0 | $403,469 | $403,469 |
| Feb 2048 | $0 | $403,004 | $403,004 |
| Feb 2049 | $0 | $402,306 | $402,306 |
| Feb 2050 | $0 | $401,453 | $401,453 |
| Feb 2051 | $0 | $401,030 | $401,030 |
| Feb 2052 | $0 | $400,706 | $400,706 |
| Feb 2053 | $0 | $400,398 | $400,398 |
| Feb 2054 | $0 | $400,104 | $400,104 |
| Feb 2055 | $0 | $399,824 | $399,824 |
| Feb 2056 | $0 | $399,557 | $399,557 |
| Feb 2057 | $0 | $399,305 | $399,305 |
| Feb 2058 | $0 | $399,067 | $399,067 |
| Feb 2059 | $0 | $398,843 | $398,843 |
| Feb 2060 | $0 | $398,633 | $398,633 |
| Feb 2061 | $0 | $398,436 | $398,436 |
| Feb 2062 | $0 | $398,254 | $398,254 |
| **Total** | $10,204,040 | $15,704,048 | $25,908,088 |

# NIST BLCC 5.3-21: Detailed LCC Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

## General Information

| | |
|---|---|
| File Name: | C:\Users\pereiraj\Desktop\Active Projects\T4511 Courtney Tower\Courtney T4511_LCCA.xml |
| Date of Study: | Wed May 31 11:19:08 EDT 2023 |
| Analysis Type: | FEMP Analysis, Energy Project |
| Project Name: | Courtney T4511 |
| Project Location: | District of Columbia |
| Analyst: | EXP |
| Base Date: | February 1, 2023 |
| Service Date: | February 1, 2024 |
| Study Period: | 40 years 0 months (February 1, 2023 through January 31, 2063) |
| Discount Rate: | 3% |
| Discounting Convention: | End-of-Year |

Discount and Escalation Rates are REAL (exclusive of general inflation)

# Alternative: Proposed Case

## Initial Cost Data (not Discounted)

### Initial Capital Costs

**(adjusted for price escalation)**

Initial Capital Costs for All Components: $9,038,720

**Component: Mini-split heat pumps, DOAS**

**Cost-Phasing**

| Date | Portion | Yearly Cost |
|---|---|---|
| February 1, 2023 | 100% | $9,038,720 |
| | --- | --- |
| Total (for Component) | | $9,038,720 |

## Energy Costs: Electricity

**(base-year dollars)**

| Average Annual Usage | Average Price/Unit | Average Annual Cost | Average Annual Demand | Average Annual Rebate |
|---|---|---|---|---|
| 2,619,640.0 kWh | $0.13800 | $361,510 | $0 | $0 |

## Life-Cycle Cost Analysis

| | Present Value | Annual Value |
|---|---|---|
| Initial Capital Costs | $9,038,720 | $391,050 |

| | | |
|---|---|---|
| **Energy Costs** | | |
| Energy Consumption Costs | $7,406,292 | $320,425 |
| Energy Demand Charges | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| Subtotal (for Energy): | $7,406,292 | $320,425 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| **Operating, Maintenance & Repair Costs** | | |
| Component: Mini-split heat pumps, DOAS | | |
| Annually Recurring Costs | $0 | $0 |
| Non-Annually Recurring Costs | $0 | $0 |
| Subtotal (for OM&R): | $0 | $0 |
| **Replacements to Capital Components** | | |
| Component: Mini-split heat pumps, DOAS | $1,214,714 | $52,553 |
| Subtotal (for Replacements): | $1,214,714 | $52,553 |
| **Residual Value of Original Capital Components** | | |
| Component: Mini-split heat pumps, DOAS | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |
| **Residual Value of Capital Replacements** | | |
| Component: Mini-split heat pumps, DOAS | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |
| **Total Life-Cycle Cost** | $17,659,726 | $764,029 |

## Emissions Summary

| Energy Name | Annual | Life-Cycle |
|---|---|---|
| Electricity: | | |

Electricity:

| | | |
|---|---|---|
| CO2 | 521,526.53 kg | 20,338,463.72 kg |
| SO2 | 56.59 kg | 2,206.78 kg |
| NOx | 5,017.40 kg | 195,668.25 kg |

Total:

| | | |
|---|---|---|
| CO2 | 521,526.53 kg | 20,338,463.72 kg |
| SO2 | 56.59 kg | 2,206.78 kg |
| NOx | 5,017.40 kg | 195,668.25 kg |

# Alternative: ECM 1

## Initial Cost Data (not Discounted)

### Initial Capital Costs

**(adjusted for price escalation)**

Initial Capital Costs for All Components: $13,203,080

**Component: DOAS w/ FCUs and Air Cooled Chiller**
**Cost-Phasing**

| Date | Portion | Yearly Cost |
|---|---|---|
| February 1, 2023 | 100% | $13,203,080 |
| | --- | --- |
| Total (for Component) | | $13,203,080 |

### Energy Costs: Electricity

**(base-year dollars)**

| Average Annual Usage | Average Price/Unit | Average Annual Cost | Average Annual Demand | Average Annual Rebate |
|---|---|---|---|---|
| 2,792,542.0 kWh | $0.13800 | $385,371 | $0 | $0 |

## Life-Cycle Cost Analysis

| | Present Value | Annual Value |
|---|---|---|
| Initial Capital Costs | $13,203,080 | $571,217 |
| **Energy Costs** | | |
| Energy Consumption Costs | $7,895,123 | $341,574 |
| Energy Demand Charges | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| | --- | --- |
| Subtotal (for Energy): | $7,895,123 | $341,574 |



| | | |
|---|---|---|
| Water Usage Costs | $0 | $0 |

| | | |
|---|---|---|
| Water Disposal Costs | $0 | $0 |

**Operating, Maintenance & Repair Costs**

| | | |
|---|---|---|
| Component: DOAS w/ FCUs and Air Cooled Chiller | | |
| Annually Recurring Costs | $0 | $0 |
| Non-Annually Recurring Costs | $0 | $0 |
| Subtotal (for OM&R): | $0 | $0 |

**Replacements to Capital Components**

| | | |
|---|---|---|
| Component: DOAS w/ FCUs and Air Cooled Chiller | $1,774,362 | $76,766 |
| Subtotal (for Replacements): | $1,774,362 | $76,766 |

**Residual Value of Original Capital Components**

| | | |
|---|---|---|
| Component: DOAS w/ FCUs and Air Cooled Chiller | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |

**Residual Value of Capital Replacements**

| | | |
|---|---|---|
| Component: DOAS w/ FCUs and Air Cooled Chiller | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |

| | | |
|---|---|---|
| **Total Life-Cycle Cost** | $22,872,566 | $989,556 |

## Emissions Summary

| Energy Name | Annual | Life-Cycle |
|---|---|---|
| Electricity: | | |
| CO2 | 555,948.43 kg | 21,680,847.05 kg |
| SO2 | 60.32 kg | 2,352.44 kg |
| NOx | 5,348.56 kg | 208,582.78 kg |
| Total: | | |
| CO2 | 555,948.43 kg | 21,680,847.05 kg |
| SO2 | 60.32 kg | 2,352.44 kg |
| NOx | 5,348.56 kg | 208,582.78 kg |

# Alternative: ECM2

## Initial Cost Data (not Discounted)

### Initial Capital Costs
**(adjusted for price escalation)**

Initial Capital Costs for All Components: $7,288,600

**Component: AHUs w/ VAVs**
**Cost-Phasing**

| Date | Portion | Yearly Cost |
|---|---|---|
| February 1, 2023 | 100% | $7,288,600 |
| | --- | --- |
| Total (for Component) | | $7,288,600 |

### Energy Costs: Electricity
**(base-year dollars)**

| Average Annual Usage | Average Price/Unit | Average Annual Cost | Average Annual Demand | Average Annual Rebate |
|---|---|---|---|---|
| 2,913,236.0 kWh | $0.13800 | $402,027 | $0 | $0 |

## Life-Cycle Cost Analysis

| | Present Value | Annual Value |
|---|---|---|
| Initial Capital Costs | $7,288,600 | $315,333 |
| **Energy Costs** | | |
| Energy Consumption Costs | $8,236,351 | $356,337 |
| Energy Demand Charges | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| | --- | --- |
| Subtotal (for Energy): | $8,236,351 | $356,337 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| **Operating, Maintenance & Repair Costs** | | |
| Component: AHUs w/ VAVs | | |
| Annually Recurring Costs | $0 | $0 |
| Non-Annually Recurring Costs | $0 | $0 |
| | --- | --- |
| Subtotal (for OM&R): | $0 | $0 |

**Replacements to Capital Components**

| | | |
|---|---|---|
| Component: AHUs w/ VAVs | $3,949,000 | $170,849 |
| Subtotal (for Replacements): | $3,949,000 | $170,849 |

**Residual Value of Original Capital Components**

| | | |
|---|---|---|
| Component: AHUs w/ VAVs | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |

**Residual Value of Capital Replacements**

| | | |
|---|---|---|
| Component: AHUs w/ VAVs | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |

| | | |
|---|---|---|
| **Total Life-Cycle Cost** | $19,473,951 | $842,519 |

## Emissions Summary

| Energy Name | Annual | Life-Cycle |
|---|---|---|
| Electricity: | | |
| CO2 | 579,976.58 kg | 22,617,895.86 kg |
| SO2 | 62.93 kg | 2,454.11 kg |
| NOx | 5,579.72 kg | 217,597.75 kg |
| Total: | | |
| CO2 | 579,976.58 kg | 22,617,895.86 kg |
| SO2 | 62.93 kg | 2,454.11 kg |
| NOx | 5,579.72 kg | 217,597.75 kg |

# Alternative: Base Case

## Initial Cost Data (not Discounted)

### Initial Capital Costs

**(adjusted for price escalation)**

Initial Capital Costs for All Components: $5,830,880

**Component: Copy of: AHUs w/ VAVs**

**Cost-Phasing**

| Date | Portion | Yearly Cost |
|---|---|---|
| February 1, 2023 | 100% | $5,830,880 |

Total (for Component) $5,830,880

## Energy Costs: Electricity
**(base-year dollars)**

| Average Annual Usage | Average Price/Unit | Average Annual Cost | Average Annual Demand | Average Annual Rebate |
|---|---|---|---|---|
| 1,523,713.0 kWh | $0.13800 | $210,272 | $0 | $0 |

## Energy Costs: Natural Gas
**(base-year dollars)**

| Average Annual Usage | Average Price/Unit | Average Annual Cost | Average Annual Demand | Average Annual Rebate |
|---|---|---|---|---|
| 92,762.0 Therm | $2.00000 | $185,524 | $0 | $0 |

# Life-Cycle Cost Analysis

| | Present Value | Annual Value |
|---|---|---|
| Initial Capital Costs | $5,830,880 | $252,267 |
| **Energy Costs** | | |
| Energy Consumption Costs | $8,923,849 | $386,081 |
| Energy Demand Charges | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| Subtotal (for Energy): | $8,923,849 | $386,081 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| **Operating, Maintenance & Repair Costs** | | |
| Component: Copy of: AHUs w/ VAVs | | |
| Annually Recurring Costs | $0 | $0 |
| Non-Annually Recurring Costs | $0 | $0 |
| Subtotal (for OM&R): | $0 | $0 |
| **Replacements to Capital Components** | | |
| Component: Copy of: AHUs w/ VAVs | $3,159,200 | $136,679 |

| | | |
|---|---|---|
| Subtotal (for Replacements): | $3,159,200 | $136,679 |

**Residual Value of Original Capital Components**

| | | |
|---|---|---|
| Component: Copy of: AHUs w/ VAVs | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |

**Residual Value of Capital Replacements**

| | | |
|---|---|---|
| Component: Copy of: AHUs w/ VAVs | $0 | $0 |
| Subtotal (for Residual Value): | $0 | $0 |

| | | |
|---|---|---|
| **Total Life-Cycle Cost** | $17,913,929 | $775,026 |

## Emissions Summary

| Energy Name | Annual | Life-Cycle |
|---|---|---|
| Electricity: | | |
| CO2 | 303,345.78 kg | 11,829,862.72 kg |
| SO2 | 32.91 kg | 1,283.58 kg |
| NOx | 2,918.37 kg | 113,810.39 kg |
| Natural Gas: | | |
| CO2 | 489,960.42 kg | 19,107,450.46 kg |
| SO2 | 3,954.14 kg | 154,203.16 kg |
| NOx | 577.46 kg | 22,519.77 kg |
| Total: | | |
| CO2 | 793,306.21 kg | 30,937,313.17 kg |
| SO2 | 3,987.05 kg | 155,486.73 kg |
| NOx | 3,495.83 kg | 136,330.16 kg |

# NIST BLCC 5.3-21: Input Data Listing

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

## General Information

| | |
|---|---|
| File Name: | C:\Users\pereiraj\Desktop\Active Projects\T4511 Courtney Tower\Courtney T4511_LCCA.xml |
| Date of Study: | Wed May 31 11:17:54 EDT 2023 |
| Analysis Type: | FEMP Analysis, Energy Project |
| Project Name: | Courtney T4511 |
| Project Location: | District of Columbia |
| Analyst: | EXP |
| Base Date: | February 1, 2023 |
| Service Date: | February 1, 2024 |
| Study Period: | 40 years 0 months (February 1, 2023 through January 31, 2063) |
| Discount Rate: | 3% |
| Discounting Convention: | End-of-Year |

Discount and Escalation Rates are REAL (exclusive of general inflation)

# Alternative: Proposed Case

## Energy: Electricity

| | |
|---|---|
| Annual Consumption: | 2,619,640.0 kWh |
| Price per Unit: | $0.13800 |
| Demand Charge: | $0 |
| Utility Rebate: | $0 |
| Location: | District of Columbia |
| Rate Schedule: | Commercial |
| State: | District of Columbia |

### Usage Indices

| From Date | Duration | Usage Index |
|---|---|---|
| February 1, 2024 | Remaining | 100% |

### Escalation Rates

| From Date | Duration | Escalation |
|---|---|---|
| April 1, 2021 | 1 year 0 months | 0.04% |
| April 1, 2022 | 1 year 0 months | -1% |
| April 1, 2023 | 1 year 0 months | -1.31% |
| April 1, 2024 | 1 year 0 months | -0.95% |

| | | |
|---|---|---|
| April 1, 2025 | 1 year 0 months | -0.04% |
| April 1, 2026 | 1 year 0 months | 0.11% |
| April 1, 2027 | 1 year 0 months | -0.04% |
| April 1, 2028 | 1 year 0 months | 0.23% |
| April 1, 2029 | 1 year 0 months | -0.11% |
| April 1, 2030 | 1 year 0 months | -0.46% |
| April 1, 2031 | 1 year 0 months | -0.73% |
| April 1, 2032 | 1 year 0 months | 0% |
| April 1, 2033 | 1 year 0 months | -0.12% |
| April 1, 2034 | 1 year 0 months | -0.31% |
| April 1, 2035 | 1 year 0 months | -0.54% |
| April 1, 2036 | 1 year 0 months | -0.51% |
| April 1, 2037 | 1 year 0 months | -0.59% |
| April 1, 2038 | 1 year 0 months | -0.55% |
| April 1, 2039 | 1 year 0 months | -0.48% |
| April 1, 2040 | 1 year 0 months | -0.48% |
| April 1, 2041 | 1 year 0 months | -0.36% |
| April 1, 2042 | 1 year 0 months | -1% |
| April 1, 2043 | 1 year 0 months | -0.53% |
| April 1, 2044 | 1 year 0 months | -0.45% |
| April 1, 2045 | 1 year 0 months | -0.78% |
| April 1, 2046 | 1 year 0 months | -0.37% |
| April 1, 2047 | 1 year 0 months | -0.46% |
| April 1, 2048 | 1 year 0 months | -0.87% |
| April 1, 2049 | 1 year 0 months | -0.97% |
| April 1, 2050 | 1 year 0 months | -0.97% |
| April 1, 2051 | Remaining | -0.73% |

## Component: Mini-split heat pumps, DOAS

### Initial Investment

| | |
|---|---|
| Initial Cost (base-year $): | $9,038,720 |
| Annual Rate of Increase: | 0% |
| Expected Asset Life: | 20 years 0 months |
| Residual Value Factor: | 0% |

### Cost-Phasing

Cost Adjustment Factor: 0%

Cost Adjustment Factor: 0%

| Years/Months (from Date) | Date | Portion |
|---|---|---|
| 0 years 0 months | February 1, 2023 | 100% |

### Replacement: Mini-split heat pumps, DOAS Replacement #1

| | |
|---|---|
| Years/Months: | 20 years 0 months |
| Amount: | $2,259,680 |
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 20 years 0 months |
| Residual Value Factor: | 0% |

## Alternative: ECM 1

### Energy: Electricity

| | |
|---|---|
| Annual Consumption: | 2,792,542.0 kWh |
| Price per Unit: | $0.13800 |
| Demand Charge: | $0 |
| Utility Rebate: | $0 |
| Location: | District of Columbia |
| Rate Schedule: | Commercial |
| State: | District of Columbia |

#### Usage Indices

| From Date | Duration | Usage Index |
|---|---|---|
| February 1, 2024 | Remaining | 100% |

#### Escalation Rates

| From Date | Duration | Escalation |
|---|---|---|
| April 1, 2021 | 1 year 0 months | 0.04% |
| April 1, 2022 | 1 year 0 months | -1% |
| April 1, 2023 | 1 year 0 months | -1.31% |
| April 1, 2024 | 1 year 0 months | -0.95% |
| April 1, 2025 | 1 year 0 months | -0.04% |
| April 1, 2026 | 1 year 0 months | 0.11% |
| April 1, 2027 | 1 year 0 months | -0.04% |
| April 1, 2028 | 1 year 0 months | 0.23% |
| April 1, 2029 | 1 year 0 months | -0.11% |
| April 1, 2030 | 1 year 0 months | -0.46% |
| April 1, 2031 | 1 year 0 months | [illegible] |

| | | |
|---|---|---|
| April 1, 2031 | 1 year 0 months | -0.73% |
| April 1, 2032 | 1 year 0 months | 0% |
| April 1, 2033 | 1 year 0 months | -0.12% |
| April 1, 2034 | 1 year 0 months | -0.31% |
| April 1, 2035 | 1 year 0 months | -0.54% |
| April 1, 2036 | 1 year 0 months | -0.51% |
| April 1, 2037 | 1 year 0 months | -0.59% |
| April 1, 2038 | 1 year 0 months | -0.55% |
| April 1, 2039 | 1 year 0 months | -0.48% |
| April 1, 2040 | 1 year 0 months | -0.48% |
| April 1, 2041 | 1 year 0 months | -0.36% |
| April 1, 2042 | 1 year 0 months | -1% |
| April 1, 2043 | 1 year 0 months | -0.53% |
| April 1, 2044 | 1 year 0 months | -0.45% |
| April 1, 2045 | 1 year 0 months | -0.78% |
| April 1, 2046 | 1 year 0 months | -0.37% |
| April 1, 2047 | 1 year 0 months | -0.46% |
| April 1, 2048 | 1 year 0 months | -0.87% |
| April 1, 2049 | 1 year 0 months | -0.97% |
| April 1, 2050 | 1 year 0 months | -0.97% |
| April 1, 2051 | Remaining | -0.73% |

## Component: DOAS w/ FCUs and Air Cooled Chiller

### Initial Investment

| | |
|---|---|
| Initial Cost (base-year $): | $13,203,080 |
| Annual Rate of Increase: | 0% |
| Expected Asset Life: | 20 years 0 months |
| Residual Value Factor: | 0% |

#### Cost-Phasing

Cost Adjustment Factor: 0%

| Years/Months (from Date) | Date | Portion |
|---|---|---|
| 0 years 0 months | February 1, 2023 | 100% |

## Replacement: DOAS w/ FCUs and Air Cooled Chiller Replacement #1

Years/Months: 20 years 0 months

Amount: $3,300,770

Annual Rate Of Increase: 0%

Expected Asset Life: 20 years, 0 months

Residual Value Factor: 0%

# Alternative: ECM2

## Energy: Electricity

| | |
|---|---|
| Annual Consumption: | 2,913,236.0 kWh |
| Price per Unit: | $0.13800 |
| Demand Charge: | $0 |
| Utility Rebate: | $0 |
| Location: | District of Columbia |
| Rate Schedule: | Commercial |
| State: | District of Columbia |

### Usage Indices

| From Date | Duration | Usage Index |
|---|---|---|
| February 1, 2024 | Remaining | 100% |

### Escalation Rates

| From Date | Duration | Escalation |
|---|---|---|
| April 1, 2021 | 1 year 0 months | 0.04% |
| April 1, 2022 | 1 year 0 months | -1% |
| April 1, 2023 | 1 year 0 months | -1.31% |
| April 1, 2024 | 1 year 0 months | -0.95% |
| April 1, 2025 | 1 year 0 months | -0.04% |
| April 1, 2026 | 1 year 0 months | 0.11% |
| April 1, 2027 | 1 year 0 months | -0.04% |
| April 1, 2028 | 1 year 0 months | 0.23% |
| April 1, 2029 | 1 year 0 months | -0.11% |
| April 1, 2030 | 1 year 0 months | -0.46% |
| April 1, 2031 | 1 year 0 months | -0.73% |
| April 1, 2032 | 1 year 0 months | 0% |
| April 1, 2033 | 1 year 0 months | -0.12% |
| April 1, 2034 | 1 year 0 months | -0.31% |
| April 1, 2035 | 1 year 0 months | -0.54% |
| April 1, 2036 | 1 year 0 months | -0.51% |
| April 1, 2037 | 1 year 0 months | -0.59% |

| | | |
|---|---|---|
| April 1, 2038 | 1 year 0 months | -0.55% |
| April 1, 2039 | 1 year 0 months | -0.48% |
| April 1, 2040 | 1 year 0 months | -0.48% |
| April 1, 2041 | 1 year 0 months | -0.36% |
| April 1, 2042 | 1 year 0 months | -1% |
| April 1, 2043 | 1 year 0 months | -0.53% |
| April 1, 2044 | 1 year 0 months | -0.45% |
| April 1, 2045 | 1 year 0 months | -0.78% |
| April 1, 2046 | 1 year 0 months | -0.37% |
| April 1, 2047 | 1 year 0 months | -0.46% |
| April 1, 2048 | 1 year 0 months | -0.87% |
| April 1, 2049 | 1 year 0 months | -0.97% |
| April 1, 2050 | 1 year 0 months | -0.97% |
| April 1, 2051 | Remaining | -0.73% |

## Component: AHUs w/ VAVs

### Initial Investment

| | |
|---|---|
| Initial Cost (base-year $): | $7,288,600 |
| Annual Rate of Increase: | 0% |
| Expected Asset Life: | 20 years 0 months |
| Residual Value Factor: | 0% |

#### Cost-Phasing

Cost Adjustment Factor: 0%

| Years/Months (from Date) | Date | Portion |
|---|---|---|
| 0 years 0 months | February 1, 2023 | 100% |

## Replacement: High Efficiency PTACs Replacement #1

| | |
|---|---|
| Years/Months: | 10 years 0 months |
| Amount: | $1,822,150 |
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 10 years 0 months |
| Residual Value Factor: | 0% |

## Replacement: High Efficiency PTACs Replacement #2

| | |
|---|---|
| Years/Months: | 10 years 0 months |
| Amount: | $1,822,150 |

| | |
|---|---|
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 10 years 0 months |
| Residual Value Factor: | 0% |

### Replacement: High Efficiency PTACs Replacement #3

| | |
|---|---|
| Years/Months: | 10 years 0 months |
| Amount: | $1,822,150 |
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 10 years 0 months |
| Residual Value Factor: | 0% |

## Alternative: Base Case

### Energy: Electricity

| | |
|---|---|
| Annual Consumption: | 1,523,713.0 kWh |
| Price per Unit: | $0.13800 |
| Demand Charge: | $0 |
| Utility Rebate: | $0 |
| Location: | District of Columbia |
| Rate Schedule: | Commercial |
| State: | District of Columbia |

#### Usage Indices

| From Date | Duration | Usage Index |
|---|---|---|
| February 1, 2024 | Remaining | 100% |

#### Escalation Rates

| From Date | Duration | Escalation |
|---|---|---|
| April 1, 2021 | 1 year 0 months | 0.04% |
| April 1, 2022 | 1 year 0 months | -1% |
| April 1, 2023 | 1 year 0 months | -1.31% |
| April 1, 2024 | 1 year 0 months | -0.95% |
| April 1, 2025 | 1 year 0 months | -0.04% |
| April 1, 2026 | 1 year 0 months | 0.11% |
| April 1, 2027 | 1 year 0 months | -0.04% |
| April 1, 2028 | 1 year 0 months | 0.23% |
| April 1, 2029 | 1 year 0 months | -0.11% |
| April 1, 2030 | 1 year 0 months | -0.46% |

| | | |
|---|---|---|
| April 1, 2031 | 1 year 0 months | -0.73% |
| April 1, 2032 | 1 year 0 months | 0% |
| April 1, 2033 | 1 year 0 months | -0.12% |
| April 1, 2034 | 1 year 0 months | -0.31% |
| April 1, 2035 | 1 year 0 months | -0.54% |
| April 1, 2036 | 1 year 0 months | -0.51% |
| April 1, 2037 | 1 year 0 months | -0.59% |
| April 1, 2038 | 1 year 0 months | -0.55% |
| April 1, 2039 | 1 year 0 months | -0.48% |
| April 1, 2040 | 1 year 0 months | -0.48% |
| April 1, 2041 | 1 year 0 months | -0.36% |
| April 1, 2042 | 1 year 0 months | -1% |
| April 1, 2043 | 1 year 0 months | -0.53% |
| April 1, 2044 | 1 year 0 months | -0.45% |
| April 1, 2045 | 1 year 0 months | -0.78% |
| April 1, 2046 | 1 year 0 months | -0.37% |
| April 1, 2047 | 1 year 0 months | -0.46% |
| April 1, 2048 | 1 year 0 months | -0.87% |
| April 1, 2049 | 1 year 0 months | -0.97% |
| April 1, 2050 | 1 year 0 months | -0.97% |
| April 1, 2051 | Remaining | -0.73% |

## Energy: Natural Gas

| | |
|---|---|
| Annual Consumption: | 92,762.0 Therm |
| Price per Unit: | $2.00000 |
| Demand Charge: | $0 |
| Utility Rebate: | $0 |
| End-Use: | Industrial Boiler, uncontrolled |
| Rate Schedule: | Residential |
| State: | District of Columbia |

### Usage Indices

| From Date | Duration | Usage Index |
|---|---|---|
| February 1, 2024 | Remaining | 100% |

### Escalation Rates

| From Date | Duration | Escalation |
|---|---|---|
| April 1, 2021 | 1 year 0 months | 1.7% |

| | | |
|---|---|---|
| April 1, 2022 | 1 year 0 months | 0.58% |
| April 1, 2023 | 1 year 0 months | 0.17% |
| April 1, 2024 | 1 year 0 months | 1.24% |
| April 1, 2025 | 1 year 0 months | 1.88% |
| April 1, 2026 | 1 year 0 months | 1.2% |
| April 1, 2027 | 1 year 0 months | 0.95% |
| April 1, 2028 | 1 year 0 months | 1.1% |
| April 1, 2029 | 1 year 0 months | 0.78% |
| April 1, 2030 | 1 year 0 months | 0.54% |
| April 1, 2031 | 1 year 0 months | 0.54% |
| April 1, 2032 | 1 year 0 months | 0.76% |
| April 1, 2033 | 1 year 0 months | 0.61% |
| April 1, 2034 | 1 year 0 months | 0.6% |
| April 1, 2035 | 1 year 0 months | 0.37% |
| April 1, 2036 | 1 year 0 months | 0.37% |
| April 1, 2037 | 1 year 0 months | 0.45% |
| April 1, 2038 | 1 year 0 months | 0.37% |
| April 1, 2039 | 1 year 0 months | 0.29% |
| April 1, 2040 | 1 year 0 months | 0.29% |
| April 1, 2041 | 1 year 0 months | 0.29% |
| April 1, 2042 | 1 year 0 months | 0.22% |
| April 1, 2043 | 1 year 0 months | 0.22% |
| April 1, 2044 | 1 year 0 months | 0.36% |
| April 1, 2045 | 1 year 0 months | 0.29% |
| April 1, 2046 | 1 year 0 months | 0.43% |
| April 1, 2047 | 1 year 0 months | 0.43% |
| April 1, 2048 | 1 year 0 months | 0.5% |
| April 1, 2049 | 1 year 0 months | 0.5% |
| April 1, 2050 | 1 year 0 months | 0.43% |
| April 1, 2051 | Remaining | 0.46% |

## Component: Copy of: AHUs w/ VAVs

### Initial Investment

Initial Cost (base-year $): $5,830,880

Annual Rate of Increase: 0%

Expected Asset Life: 20 years 0 months

Residual Value Factor: 0%

**Cost-Phasing**

Cost Adjustment Factor: 0%

| Years/Months (from Date) | Date | Portion |
|---|---|---|
| 0 years 0 months | February 1, 2023 | 100% |

## Replacement: PTACs Replacement #1

| | |
|---|---|
| Years/Months: | 10 years 0 months |
| Amount: | $1,457,720 |
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 10 years 0 months |
| Residual Value Factor: | 0% |

## Replacement: PTACs Replacement #2

| | |
|---|---|
| Years/Months: | 10 years 0 months |
| Amount: | $1,457,720 |
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 10 years 0 months |
| Residual Value Factor: | 0% |

## Replacement: PTACs Replacement #3

| | |
|---|---|
| Years/Months: | 10 years 0 months |
| Amount: | $1,457,720 |
| Annual Rate Of Increase: | 0% |
| Expected Asset Life: | 10 years 0 months |
| Residual Value Factor: | 0% |

# NIST BLCC 5.3-21: Lowest LCC

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

## General Information

| | |
|---|---|
| File Name: | C:\Users\pereiraj\Desktop\Active Projects\T4511 Courtney Tower\Courtney T4511_LCCA.xml |
| Date of Study: | Wed May 31 11:20:32 EDT 2023 |
| Analysis Type: | FEMP Analysis, Energy Project |
| Project Name: | Courtney T4511 |
| Project Location: | District of Columbia |
| Analyst: | EXP |
| Base Date: | February 1, 2023 |
| Service Date: | February 1, 2024 |
| Study Period: | 40 years 0 months (February 1, 2023 through January 31, 2063) |
| Discount Rate: | 3% |
| Discounting Convention: | End-of-Year |

## Lowest LCC

**Comparative Present-Value Costs of Alternatives**
**(Shown in Ascending Order of Initial Cost, * = Lowest LCC)**

| Alternative | Initial Cost (PV) | Life Cycle Cost (PV) |
|---|---|---|
| Base Case | $5,830,880 | $17,913,929 |
| ECM2 | $7,288,600 | $19,473,951 |
| Proposed Case | $9,038,720 | $17,659,726 * |
| ECM 1 | $13,203,080 | $22,872,566 |

# NIST BLCC 5.3-21: Summary LCC

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

## General Information

| | |
|---|---|
| File Name: | C:\Users\pereiraj\Desktop\Active Projects\T4511 Courtney Tower\Courtney T4511_LCCA.xml |
| Date of Study: | Wed May 31 11:20:12 EDT 2023 |
| Analysis Type: | FEMP Analysis, Energy Project |
| Project Name: | Courtney T4511 |
| Project Location: | District of Columbia |
| Analyst: | EXP |
| Base Date: | February 1, 2023 |
| Service Date: | February 1, 2024 |
| Study Period: | 40 years 0 months (February 1, 2023 through January 31, 2063) |
| Discount Rate: | 3% |
| Discounting Convention: | End-of-Year |

Discount and Escalation Rates are REAL (exclusive of general inflation)

# Alternative: Proposed Case

## LCC Summary

| | Present Value | Annual Value |
|---|---|---|
| Initial Cost | $9,038,720 | $391,050 |
| Energy Consumption Costs | $7,406,292 | $320,425 |
| Energy Demand Costs | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| Annually Recurring OM&R Costs | $0 | $0 |
| Non-Annually Recurring OM&R Costs | $0 | $0 |
| Replacement Costs | $1,214,714 | $52,553 |
| Less Remaining Value | $0 | $0 |
| | --- | --- |
| **Total Life-Cycle Cost** | $17,659,726 | $764,029 |

# Alternative: ECM 1

## LCC Summary

| | Present Value | Annual Value |
|---|---|---|
| Initial Cost | $13,203,080 | $571,217 |
| Energy Consumption Costs | $7,895,123 | $341,574 |

| | | |
|---|---|---|
| Energy Demand Costs | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| Annually Recurring OM&R Costs | $0 | $0 |
| Non-Annually Recurring OM&R Costs | $0 | $0 |
| Replacement Costs | $1,774,362 | $76,766 |
| Less Remaining Value | $0 | $0 |
| **Total Life-Cycle Cost** | $22,872,566 | $989,556 |

# Alternative: ECM2

## LCC Summary

| | Present Value | Annual Value |
|---|---|---|
| Initial Cost | $7,288,600 | $315,333 |
| Energy Consumption Costs | $8,236,351 | $356,337 |
| Energy Demand Costs | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| Annually Recurring OM&R Costs | $0 | $0 |
| Non-Annually Recurring OM&R Costs | $0 | $0 |
| Replacement Costs | $3,949,000 | $170,849 |
| Less Remaining Value | $0 | $0 |
| **Total Life-Cycle Cost** | $19,473,951 | $842,519 |

# Alternative: Base Case

## LCC Summary

| | Present Value | Annual Value |
|---|---|---|
| Initial Cost | $5,830,880 | $252,267 |
| Energy Consumption Costs | $8,923,849 | $386,081 |
| Energy Demand Costs | $0 | $0 |
| Energy Utility Rebates | $0 | $0 |
| Water Usage Costs | $0 | $0 |
| Water Disposal Costs | $0 | $0 |
| Annually Recurring OM&R Costs | $0 | $0 |

| | | |
|---|---|---|
| Non-Annually Recurring OM&R Costs | $0 | $0 |
| Replacement Costs | $3,159,200 | $136,679 |
| Less Remaining Value | $0 | $0 |
| | --- | --- |
| **Total Life-Cycle Cost** | $17,913,929 | $775,026 |

## D. Labels

All labels required to demonstrate compliance with the HPSB Guiding Principles Requirements to be provided by the GC.

## E. "S" Submittals

All product data required to demonstrate compliance with the HPSB Guiding Principles Requirements to be provided by the GC.

## F. Certifications, Assessments or Validations and Compliance Report

All product certifications and compliance reports required to demonstrate compliance with the HPSB Guiding Principles Requirements are attached below.

## G. TPC Documentation

No certification will be pursued for Third Party Certification (TPC) as stated in the project SSOW.

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SPECIAL PROJECT PROCEDURES

**11/20, CHG 1: 02/22**

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1.1 SUBMITTALS

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 MODEL UNIT
3.1.1 Model Unit Description
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SECTION 01 35 13

SPECIAL PROJECT PROCEDURES
**11/20, CHG 1: 02/22**

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-04 Samples

Model Unit

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 MODEL UNIT

Prior to placement of material orders for components of the family housing units and the installation of those components throughout the project, the Contractor must complete the construction of the components of the model unit, and gain the approval of the Contracting Officer for the materials and workmanship therein.

3.1.1 Model Unit Description

Provide a model unit made up of enough single family housing units to show all of the different levels of completion required below. The model unit must have enough housing units to show all level of completion simultaneously, except for foundation and floor slab levels which are approved by the Contracting Officer and covered by following levels. The model unit must be family housing units constructed at the location agreed upon with the Contracting Officer and a part of the permanent structure as indicated.

3.1.2 Model Unit Requirements

Adhere to the following requirements for model construction:

a. Provide materials in model unit identical to those actually approved in submittals. The QC Manager and Organization must approve and process submittals in accordance with Section 01 33 00 SUBMITTAL PROCEDURES. Do not procure, fabricate, or install materials prior to approval by the Contracting Officer.

b. The Contracting Officer retains the right to disapprove and reject materials or items which are not in compliance with the project drawings and specifications.

c. After approval of initial product submittals, provide full size samples of these components in the required color, and in sufficient quantity to completely outfit the model unit. Provide full size samples as dictated by the construction schedule for installation of those components in the model unit. Do not order or approve production of materials beyond those required for the model unit, until the full size samples have been installed in the model unit and approved by the Contracting Officer.

d. Proceed immediately with construction of the model unit after the Contracting Officer acknowledges the required product submittals are approved.

e. Provide temporary utilities and climate control necessary to construct, inspect, approve, and maintain the model unit.

f. Prior to completion and approval of the model unit, and with written permission to start from the Contracting Officer, the Contractor may perform general sitework and run major utility lines for the rest of the project.

g. As each model unit's level of completion is approved by the Contracting Officer, construction of that level's components throughout the remainder of the project may proceed.

### 3.1.3 Model Unit Levels of Completion

Model unit must be exhibited and approved at the following 3 levels of completion:

Level 1, model must be available for Government inspection for 28 calendar days.

Levels 2 through 3, model unit must be available for Government inspection for 10 calendar days per level.

a. Level 1 (Plumbing, Mechanical and Electrical rough-in Level) - Exhibit electrical conduit and box location for switches, outlets fixtures, cable and data collection, ductwork, built-in plumbing fixtures, plumbing piping, and water pressure test of all plumbing pipe.

b. Level 2 (Interior Finishes-rough Level) - Exhibit non-veneer plaster, unspackled and uncaulked wall and ceiling finishes, insulation, interior doors, final locations of all outlets and fixtures.

c. Level 3 (Interior Finishes & Fixtures-final Level) - Exhibit final interior finishes, veneer plaster, painting, caulking, built-in shelving, cabinetwork, cabinet supported sinks, final door hardware, mechanical louvers, final electrical equipment connections, electrical fixtures, freestanding bathroom fixtures, properly functioning appliances, and operation of mechanical and electrical systems.

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SECTION 01 35 26

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# SECTION 01 35 26

# GOVERNMENTAL SAFETY REQUIREMENTS

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

| | |
|---|---|
| ASHRAE 52.2 | (2017) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size |

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

| | |
|---|---|
| ANSI/ASSP A10.34 | (2021) Protection of the Public on or Adjacent to Construction Sites |
| ANSI/ASSP A10.44 | (2020) Control of Energy Sources (Lockout/Tagout) for Construction and Demolition Operations |
| ANSI/ASSP A10.8 | (2019) Scaffolding Safety Requirements |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM D6245 | (2025) Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation |
| ASTM D6345 | (2010) Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air |
| ASTM F855 | (2020) Standard Specifications for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment |

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE 1048 | (2016) Guide for Protective Grounding of Power Lines |
| IEEE C2 | (2023) National Electrical Safety Code |

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

| | |
|---|---|
| ANSI/ISEA Z89.1 | (2014; R 2019) American National Standard for Industrial Head Protection |

Japanese Standards Association (JSA)

| | |
|---|---|
| JIS A 8951 | (1995) Tubular Steel Scaffolds |

MINISTRY OF HEALTH, LABOUR AND WELFARE, GOVERNMENT OF JAPAN (MHLW)

| | |
|---|---|
| MHLW | (1972) Amendment No. 57 - 2006 Industrial Safety and Health Law |
| ORDINANCE NO. 34 | (1972) The Safety Ordinance for Cranes |
| ORDINANCE NO. 47 | (2007) Ordinance on Industrial Safety and Health |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 51B | (2024) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work |
| NFPA 70 | (2023) National Electrical Code |
| NFPA 70E | (2024) Standard for Electrical Safety in the Workplace |
| NFPA 241 | (2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations |
| NFPA 306 | (2024) Standard for the Control of Gas Hazards on Vessels |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

| | |
|---|---|
| ANSI/SMACNA 008 | (2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910 | Occupational Safety and Health Standards |
| 29 CFR 1910.1000 | Air Contaminants |
| 29 CFR 1915 | Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment |
| 29 CFR 1926 | Safety and Health Regulations for Construction |
| CPL 2.100 | (1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146 |

## 1.2 DEFINITIONS

The following definitions are for the convenience of the reader. If there is a referenced document in the text of this specification section, that is the document that should define terms for that paragraph. If further clarification is needed, contact the Contracting Officer.

### 1.2.1 Site Safety and Health Officer (SSHO)

A Contractor Employee that is responsible for overseeing and ensuring implementation of the prime Contractor's Safety and Occupational Health (SOH) program according to the Contract, EM 385-1-1, Chapter 2 applicable federal, state, and local requirements.

#### 1.2.1.1 Level One SSHO

A designated employee with full-time SOH responsibility that meets and follows the requirements of EM 385-1-1, Chapter 2-3. In conjunction with the local Safety and Occupational Health Office (SOHO), the Contracting Officer will evaluate proposed Japanese equivalent training for applicability to the contract scope of work being performed.

#### 1.2.1.2 Level Two SSHO

A designated employee with Level Two SSHO responsibility that meets and follows the requirements of EM 385-1-1, Chapter 2-3. Level Two SSHOs cannot be assigned to projects that have a residual Risk Assessment Code (RAC) of high or extremely high.

#### 1.2.1.3 Level Three SSHO

A designated Qualified Person or Competent Person with SOH responsibility that meets and follows the requirements of EM 385-1-1, Chapter 2-3. Level 3 SSHOs cannot be assigned to projects that have a residual RAC of high or extremely high.

#### 1.2.1.4 Alternate SSHO

An employee that meets the definition of the contract-required level SSHO, but is not the primary SSHO.

### 1.2.2 Competent Person (CP)

The CP is a person designated in writing, who, through training, knowledge and experience, is capable of identifying, evaluating, and addressing existing and predictable hazards in the working environment or working conditions that are unsanitary, hazardous, or dangerous to personnel, and who has authorization to take prompt corrective measures to eliminate them.

### 1.2.3 Qualified Person (QP)

The QP is a person designated in writing, who, by possession of a recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems related to the subject matter, the work, or the project.

## 1.3 SUBMITTALS

Government Acceptance or Approval does not remove responsibility from the Contractors for their actions or liability.

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only.When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

Final IAQ Management Plan; S

Indoor Air Quality (IAQ) Management Plan; G

SD-06 Test Reports

Accident Reports; G

LHE Inspection Reports

Monthly Exposure Reports; G

SD-07 Certificates

Crane Operators/Riggers

Activity Hazard Analysis (AHA); G

Certificate of Compliance

Hot Work Permit

Standard Lift Plan; G

Certifications

Licenses

## 1.4 PUBLIC HEALTH EMERGENCIES

In the event of a declared public health emergency, follow safety precautions as required by installation emergency management requirement.

## 1.5 MONTHLY EXPOSURE REPORTS

Provide a Monthly Exposure Report and attach to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both Prime and subcontractor. Failure to submit the report may result in retention of up to 10 percent of the voucher. Monthly exposure reports are to be tracked and generated through RMS.

## 1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of

this Contract, comply with the most recent edition of USACE EM 385-1-1, MHLW Lawsand follow host nation laws, ordinances, criteria, rules and regulations at the date of the Solicitation for this Contract. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

## 1.7 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

### 1.7.1 Site Safety and Health Officer (SSHO)

#### 1.7.1.1 Qualifications of SSHO

All SSHOs will have met the training, experience requirements identified in the EM 385-1-1, Chapter 2 and this Contract. In conjunction with the local Safety and Occupational Health Office (SOHO), the Contracting Officer will evaluate proposed Japanese equivalent training for applicability to the contract scope of work being performed.

The SSHO is also required to have a minimum of five (5) years of experience as a SSHO on project similar in size and scope as this Contract.

#### 1.7.1.2 Duties of SSHO

All SSHOs will carry out the roles and responsibilities as identified in this Contract and the EM 385-1-1, Chapter 2. All SSHOs will be designated on an ENG Form 6282, as approved by the Contracting Officer. Superintendent, QC Manager, and SSHO are subject to dismissal if their required duties are not being effectively carried out. If either the Superintendent, QC Manager, or SSHO are dismissed, project work will be stopped and will not be allowed to resume until a suitable replacement is approved and the above duties are again being effectively carried out.

#### 1.7.1.3 Safety Meetings

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors at the project location. The SSHO, supervisors, or foremen must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

### 1.7.2 Roles and Responsibilities of Prime Contractor and SSHO

The Prime Contractor and SSHO must ensure that the requirements of all applicable OSHA and EM 385-1-1, Chapter 2 are met for the project. The Prime Contractor must ensure an SSHO or an equally qualified Alternate SSHO(s) is at the worksite at all times to implement and administer the Contractor's safety program and Government accepted Accident Prevention Plan. If the required SSHO has to temporarily (that is, up to 24 hours / 1 day) leave the site of work due to unforeseen or emergency situations, a Level One, Two, or Three SSHO may be used in the interim and must be on the site of work at all times when work is being performed. For features

of work with work with multiple high or extremely high RAC codes, a Level One SSHO or Alternate Level One SSHO presence is required on site at all times the work is being performed.

If the SSHO must be off-site for a period longer than 24 hours / 1 day, a qualified alternate that meets the contract requirements must be onsite.

a. Prime contractor must ensure all SSHOs will:

(1) Are designated on an ENG Form 6282.

(2) Meet minimum training and experience requirements identified in EM 385-1-1, Chapter 2.

(3) Execute roles and responsibilities identified in EM 385-1-1, Chapter 2.

1.7.3 Contract Site Safety And Health Officer(s)(SSHOs) Minimum Requirements

Provide a minimum of one Level One SSHO that meets the requirements of EM 385-1-1 Chapter 2 for this project.

1.7.4 Competent Person for Confined Space Entry

Provide a CP for Confined Space Entry who meets the requirements of EM 385-1-1, Chapter 34 and herein. The CP for Confined Space Entry must supervise the entry into each confined space.

Since this work involves operations that handle combustible or hazardous materials, this person must have the ability to understand and follow through on the air sampling, Personal Protective Equipment (PPE), and instructions of a Marine Chemist, Coast Guard authorized persons, or Certified Industrial Hygienist. Confined space and enclosed space work must comply with NFPA 306, 29 CFR 1915, "Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment," or as applicable in 29 CFR 1910 for general industry, 29 CFR 1926 for construction.

1.7.5 Crane Operators/Riggers

Provide Operators meeting the requirements in EM 385-1-1, Chapter 15 for Riggers and Chapter 16 for Crane Operators. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacities of 22,680 kg or greater, designate crane operators qualified by a source that qualifies crane operators (i.e., union, a Government agency, or an organization that tests and qualifies crane operators). Provide proof of current qualification.

1.7.5.1 Load Handling Equipment Operator Accepted Alterative

The Commander, POJ, has determined that there are adequate provisions provided under the Government of Japan (GOJ) Ordinance to achieve the required protections for crane operator licensing and practical training requirements employed as part of contracted activities provided for USACE within the locality of Japan. Reference POJ-SO decision memorandum, subject, Alternate Requirement Analysis - Load Handling Equipment, Qualifications, dated 8 January 2020.

Provisions within the JISHA (ORDINANCE NO. 34) Articles 223-228 provide

sufficient confirmation of an operator's certification/qualification and practical training to achieve the intent of EM 385-1-1, Chapter 16-3.

JISHA (ORDINANCE NO. 34) Articles 223 establishes the Director of the Prefectural Labour Bureau as the licensing authority. Based upon this Article the Ministry of Labour is the recognized auditor, established for local accreditation of certification and training programs.

1.7.6 Preconstruction Conference

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the preconstruction conference. This includes the project superintendent, Site Safety and Occupational Health Officer, quality control manager, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures, and a listing of anticipated AHAs that will be developed and implemented during the performance of the Contract. This list of proposed AHAs will be reviewed and an agreement will be reached between the Contractor and the Contracting Officer as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, and Government review of AHAs to preclude project delays. The creation of the APP and Schedule will be created after being given Notice to Proceed.

c. Deficiencies in the submitted APP, identified during the Contracting Officer's review, must be corrected, and the APP re-submitted for review prior to the start of construction. Work is not permitted to begin until an APP is established that is acceptable to the Contracting Officer.

1.8 ACCIDENT PREVENTION PLAN (APP)

1.8.1 Construction Accident Prevention Plan (APP)

Submit the Accident Prevention Plan (APP) for review and acceptance by the Government at least 15 calendar days prior to the start, after being given Notice to Proceed. A competent person must prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of EM 385-1-1, ENG Form 6293, and herein. The APP must be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP must interface with the Contractor's overall safety and occupational health program referenced in the APP in the applicable APP element, and made site-specific. Describe the methods to evaluate past safety performance of potential subcontractors in the selection process. Also, describe innovative methods used to ensure and monitor safe work practices of subcontractors. The Government considers the Prime Contractor to be the "controlling employer" for all worksite safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the Contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP must be signed in accordance with ENG Form 6293 Accident Prevention Plan Worksheet. The SSHO

must provide and maintain the APP and a log of signatures by each subcontractor foreman, attesting that they have read and understand the APP, and make the APP and log available on-site to the Contracting Officer. If English is not the foreman's primary language, the Prime Contractor must provide an interpreter.

Submit the APP to the Contracting Officer as attachment 01 35 26-A "ACCIDENT PREVENTION PLAN (APP) WORKSHEET; ENG Form 6293" 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. Once reviewed and accepted by the Contracting Officer, the APP and attachments will be enforced as part of the Contract. Disregarding the provisions of this Contract or the accepted APP is cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. Continuously review and amend the APP, as necessary, throughout the life of the Contract. Changes to the accepted APP must be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and Quality Control Manager. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered. Should any severe hazard exposure (i.e., imminent danger) become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate and remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ANSI/ASSP A10.34), and the environment.

Copies of the accepted APP shall be maintained at the resident engineer's office and at the job site. Continuously review and amend the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as discovered.

### 1.8.2 Names and Qualifications

Provide plans in accordance with the requirements outlined in EM 385-1-1, including the following:

a. Names and qualifications (resumes including education, training, experience and certifications) of site safety and health personnel designated to perform work on this project to include the designated Site Safety and Health Officer and other competent and qualified personnel to be used. Specify the duties of each position.

b. As a minimum, designate and submit qualifications of Competent Persons (CP) for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; and personal protective equipment and clothing to include selection, use and maintenance. Designate and submit qualifications for additional CPs as applicable to the work performed under this Contract.

### 1.8.3 Plans

Provide plans in the APP in accordance with the requirements outlined in EM 385-1-1, including the following:

#### 1.8.3.1 Lead, Cadmium, and Chromium Compliance Plan

Identify the safety and health aspects of work involving lead, cadmium and chromium, and prepare in accordance with Section 02 83 00 LEAD REMEDIATION.

#### 1.8.3.2 Asbestos Hazard Abatement Plan

Identify the safety and health aspects of asbestos work, and prepare in accordance with Section 02 82 00 ASBESTOS REMEDIATION.

#### 1.8.3.3 Polychlorinated Biphenyls (PCB) Plan

Identify the safety and health aspects of Polychlorinated Biphenyls work, and prepare in accordance with Sections 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs).

#### 1.8.3.4 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00 DEMOLITION and referenced sources.

## 1.9 ACTIVITY HAZARD ANALYSIS (AHA)

Before beginning each activity, task or Definable Feature of Work (DFOW) involving a type of work presenting hazards not experienced in previous project operations, or where a new work crew or subcontractor is to perform the work, the Contractor(s) performing that work activity must prepare an AHA. AHAs must be developed by the Prime Contractor, subcontractor, or supplier performing the work, and provided for Prime Contractor review and approval before submitting to the Contracting Officer. AHAs must be signed by the SSHO, Superintendent, QC Manager and the subcontractor Foreman performing the work. Format the AHA in accordance with EM 385-1-1, Chapter 2 or as directed by the Contracting Officer. Submit the AHA for review at least 15 working days prior to the start of each activity task, or DFOW. The Government reserves the right to require the Contractor to revise and resubmit the AHA if it fails to effectively identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

AHAs must identify competent persons required for phases involving high risk activities, including confined entry, crane and rigging, excavations, trenching, electrical work, fall protection, and scaffolding.

### 1.9.1 AHA Management

Review the AHA list periodically (at least monthly) at the Contractor supervisory safety meeting, and update as necessary when procedures, scheduling, or hazards change. Use the AHA during daily inspections by the SSHO to ensure the implementation and effectiveness of the required safety and health controls for that work activity.

### 1.9.2 AHA Signature Log

Each employee performing work as part of an activity, task or DFOW must review the AHA for that work and sign a signature log specifically maintained for that AHA prior to starting work on that activity. The SSHO must maintain a signature log on site for every AHA. Provide employees whose primary language is other than English, with an interpreter to

ensure a clear understanding of the AHA and its contents.

## 1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in paragraph REFERENCES. Maintain applicable equipment manufacturer's manuals.

## 1.11 EMERGENCY MEDICAL TREATMENT

Contractors must arrange for their own emergency medical treatment in accordance with EM 385-1-1. The Government has no responsibility to provide emergency medical treatment.

## 1.12 NOTIFICATIONS AND REPORTS

### 1.12.1 Accident Notification

Notify the Contracting Officer in accordance with the EM 385-1-1 Accident Reporting Timeline.

**Table**
**Accident Reporting Required Timeline**

| Accident Type | Notify KO or COR | Complete Final Accident Report on ENG 3394 and provide to KO or COR |
|---|---|---|
| Fatality, in-patient hospitalization, amputation, eye loss, or property damage over $600,000. | Immediately, no later than (NLT) 8 Hours | Within 7 Days |
| All other accidents and near misses | Immediately, no later than (NLT) 24 Hours | Within 7 Days |

Within notification include Contractor name; Contract title; type of Contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (for example, type of construction equipment used and PPE used). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted. Assist and cooperate fully with the Government's investigation(s) of any accident or near miss.

### 1.12.2 Accident Reports

a. Conduct an accident investigation for recordable injuries and illnesses, property damage, and near misses as defined in EM 385-1-1 to establish the root cause(s) of the accident. All accidents are reportable, regardless of whether or not it is recordable. Complete the applicable USACE Accident Report, ENG Form 3394, and provide the report to the Contracting Officer within 7 calendar days of the accident. The Contracting Officer will provide copies of any required or special forms. All accidents are reportable, regardless of whether

or not it is recordable.

b. Near Misses: Report all "Near Misses" to the Contracting Officer, using local accident reporting procedures, within 24 hours. The Contracting Officer will provide the Contractor the required forms. Near miss reports are considered positive and proactive Contractor safety management actions.

1.12.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

1.12.4 Certificate of Compliance and Pre-lift Plan/Checklist for LHE and Rigging

Provide a Certificate of Compliance for LHE entering an activity under this Contract and in accordance with EM 385-1-1, Chapter 16-10, paragraph b (16-10.b). Post certifications on the crane.

Develop a Standard Lift Plan (SLP) in accordance with EM 385-1-1, Chapter 16-10, paragraph a (16-10.a) and using Standard Pre-Lift Crane Plan/Checklist for each lift planned. Submit SLP to the Contracting Officer for approval within 15 calendar days in advance of planned lift.

1.13 HOT WORK PERMIT

1.13.1 Permit and Personnel Requirements

Submit and obtain a written permit prior to performing "Hot Work" (i.e. welding or cutting) or operating other flame-producing/spark producing devices, from the Installation Fire Department. Contractors are required to meet all criteria before a permit is issued. Provide at least two (2) 9kg 4A:20 BC rated extinguishers for normal "Hot Work". Extinguishers shall be current inspection tagged, and have approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of one hour after completion of the task or as specified on the hot work permit.

When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency Base Fire Department phone number. Report any fire, no matter how small, to the responsible Base Fire Department immediately.

1.13.2 Work Around Flammable Materials

Obtain permit approval from a NFPA Certified Marine Chemist, or Certified Industrial Hygienist for "Hot Work" within or around flammable materials (such as fuel systems or welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, or vaults) that have the potential for flammable or explosive atmospheres.

Whenever these materials, except beryllium and chromium (VI), are encountered in indoor operations, local mechanical exhaust ventilation systems that are sufficient to reduce and maintain personal exposures to within acceptable limits must be used and maintained in accordance with manufacturer's instruction and supplemented by exceptions noted in

EM 385-1-1, Chapter 6.

## 1.14 RADIATION SAFETY REQUIREMENTS

Notwithstanding any other hazardous material used in this Contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. The Contractor shall request approval in writing to the Contracting Officer not less than thirty (30) calendar days in advance of any request for exception. Following Contracting Officer approval of any radiation related exception, the Contractor shall coordinate with the Contracting Officer's Representative at least fifteen (15) calendar days in advance to notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

## 1.15 CONFINED SPACE ENTRY REQUIREMENTS

Confined space entry must comply with EM 385-1-1, Chapter 34, 29 CFR 1926, 29 CFR 1910, Host Nation, local regulatory requirements and Directive CPL 2.100. Any potential for a hazard in the confined space requires a permit system to be used. Obtain written permission from the Contracting Officer prior to confined space entry by personnel.

### 1.15.1 Rescue Procedures and Coordination with Local Emergency Responders

Develop and implement an on-site rescue and recovery plan and procedures. The rescue plan must not rely on local emergency responders for rescue from a confined space.

## 1.16 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

Submit an IAQ Management Plan within 15 calendar days after notice to proceed and not less than 10 calendar days before the preconstruction conference. Revise and resubmit Plan as required by the Contracting Officer. Make copies of the final plan available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants. Submit Final IAQ Management Plan for inclusion in the Sustainability eNotebook, in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

### 1.16.1 Requirements During Construction

Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with ASTM D6245. Provide for evaluation of volatile organic compounds (VOCs) in indoor air in accordance with ASTM D6345. Use filters with a Minimum Efficiency Reporting Value (MERV) of 8 in permanently installed air handlers during construction.

#### 1.16.1.1 Control Measures

Meet or exceed the requirements of ANSI/SMACNA 008 to help minimize contamination of the building from construction activities. The five requirements of this manual which must be adhered to are described below:

a. HVAC protection: Isolate return side of HVAC system from surrounding environment to prevent construction dust and debris from entering the duct work and spaces.

b. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products must have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.

c. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.

d. Housekeeping: Clean frequently to remove construction dust and debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.

e. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

#### 1.16.1.2 Moisture Contamination

a. Remove accumulated water and keep work dry.

b. Use dehumidification to remove moist, humid air from a work area.

c. Do not use combustion heaters or generators inside the building.

d. Protect porous materials from exposure to moisture.

e. Remove and replace items which remain damp for more than a few hours.

### 1.16.2 Requirements After Construction

After construction ends and prior to occupancy, conduct a building flush-out or test the indoor air contaminant levels. Flush-out must be a minimum 2 weeks with MERV-13 filtration media as determined by ASHRAE 52.2 at 100 percent outside air. Air contamination testing must be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Indoor Air. After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media must have a MERV of 13 as determined by ASHRAE 52.2.

## 1.17 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must comply with the applicable Storm Plan and:

a. Secure outside equipment and materials and place materials that could be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

### 3.1 CONSTRUCTION AND OTHER WORK

Comply with EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be worn or carried/available on each person. Mandatory PPE includes:

a. Head Protection that meets ANSI/ISEA Z89.1

b. Long Pants

c. Appropriate Safety Footwear

d. Appropriate Class Reflective Vests

#### 3.1.1 Worksite Communication

Employees working alone in a remote location or away from other workers must be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means). The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. Develop an employee check-in/check-out communication procedure to ensure employee safety.

#### 3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this Contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within

fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. The Contractor shall request approval in writing to the Contracting Officer not less than thirty (30) calendar days in advance of any request for exception. Following Contracting Officer approval of any radiation related exception, the Contractor shall coordinate with the Contracting Officer's Representative at least fifteen (15) calendar days in advance to notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

### 3.1.3 Unforeseen Hazardous Material

Contract documents identify materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e., 29 CFR 1910.1000). If material(s) that may be hazardous to human health upon disturbance are encountered during demolition, repair, renovation, or construction operations. Stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification.

## 3.2 UTILITY OUTAGE REQUIREMENTS

Apply for utility outages at least 45 days in advance. At a minimum, the written request must include the location of the outage, utilities being affected, duration of outage, any necessary sketches, and a description of the means to fulfill energy isolation requirements in accordance with EM 385-1-1, Chapter 12. In accordance with EM 385-1-1, Chapter 12 where outages involve Government or Utility personnel, coordinate with the Government on all activities involving the control of hazardous energy.

These activities include, but are not limited to, a review of Hazardous Energy Control Program (HECP) and HEC procedures, as well as applicable Activity Hazard Analyses (AHAs). In accordance with EM 385-1-1 and NFPA 70E, work on energized electrical circuits must not be performed without prior Government authorization. Government permission is considered through the permit process and submission of a detailed AHA. Energized work permits are considered only when de-energizing introduces additional or increased hazard or when de-energizing is infeasible.

### 3.2.1 Okinawa Utility Outages

Outages (power, water, sewer, and communications) for the following listed dates, times, and locations shall not be permitted during the performance of this Contract, unless approved by the authorized agent of the Installation Commander and Contracting Officer's Representative:

a. DoDEA Schools: No outages from 01 September through 31 July, Monday through Friday between the hours of 0700 and 1800.

b. Family Housing Areas: No outages will be allowed on Saturdays when DoDEA schools are not in session. No more than two (2) outages for the same utility service shall be allowed in a one-month period (30 calendar days), and no more than one (1) outage in a two-week period (14 calendar days).

c. U.S. Government Holidays: No outages during the following periods:

(1) New Year's Day - to include seven (7) calendar days before and one (1) calendar day after this date (contiguous with the Christmas Day outage requirement).

(2) Martin Luther King's Birthday - to include the following Tuesday.

(3) President's Day - to include the following Tuesday.

(4) Memorial Day - to include the following Tuesday.

(5) Juneteenth - to include one (1) calendar day before and after this date.

(6) Independence Day - to include one (1) calendar day before and after this date.

(7) Labor Day - to include the following Tuesday.

(8) Columbus Day - to include the preceding Friday.

(9) Veteran's Day - to include two (2) calendar days before and after this date.

(10) Thanksgiving Day - to include one (1) calendar day before and after this date.

(11) Christmas Day - to include seven (7) calendar days before and after this date (contiguous with the New Year's Day outage requirement).

d. Child Development Centers (CDC): Outages allowed only when the CDC is closed or on Sundays.

e. Marine Corps Bases: No outages during Marine Corps Balls or Change of Commands which are normally scheduled between 20 October and 21 November. Specific dates and locations shall be provided during or subsequent to the Preconstruction Conference.

## 3.3 OUTAGE COORDINATION MEETING

After the utility outage request is approved and prior to beginning work on the utility system requiring shut-down, conduct a pre-outage coordination meeting in accordance with EM 385-1-1, Chapter 12. This meeting must include the Prime Contractor, the Prime and subcontractors performing the work, the Contracting Officer, and the Installation representative. All parties must fully coordinate HEC activities with one another. During the coordination meeting, all parties must discuss and coordinate on the scope of work, HEC procedures (specifically, the lock-out/tag-out procedures for worker and utility protection), the AHA, assurance of trade personnel qualifications, identification of competent persons, and compliance with HECP training in accordance with EM 385-1-1, Chapter 12. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

## 3.4 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Provide and operate a Hazardous Energy Control Program (HECP) in accordance with EM 385-1-1, Chapter 12 29 CFR 1910, 29 CFR 1915,

ANSI/ASSP A10.44, NFPA 70E.

### 3.4.1 Safety Preparatory Inspection Coordination Meeting with the Government or Utility

For electrical distribution equipment that is to be operated by Government or Utility personnel, the Prime Contractor and the subcontractor performing the work must attend the safety preparatory inspection coordination meeting, which will also be attended by the Contracting Officer's Representative, and required by EM 385-1-1, Chapter 12. The meeting will occur immediately preceding the start of work and following the completion of the outage coordination meeting. Both the safety preparatory inspection coordination meeting and the outage coordination meeting must occur prior to conducting the outage and commencing with lockout/tagout procedures.

### 3.4.2 Lockout/Tagout Isolation

Where the Government or Utility performs equipment isolation and lockout/tagout, the Contractor must place their own locks and tags on each energy-isolating device and proceed in accordance with the HECP. Before any work begins, both the Contractor and the Government or Utility must perform energy isolation verification testing while wearing required PPE detailed in the Contractor's AHA and required by EM 385-1-1, Chapter 12. Install personal protective grounds, with tags, to eliminate the potential for induced voltage in accordance with EM 385-1-1, Chapter 12.

### 3.4.3 Lockout/Tagout Removal

Upon completion of work, conduct lockout/tagout removal procedure in accordance with the HECP. In accordance with EM 385-1-1, Chapter 12, each lock and tag must be removed from each energy isolating device by the authorized individual or systems operator who applied the device. Provide formal notification to the Government (by completing the Government form if provided by Contracting Officer's Representative), confirming that steps of de-energization and lockout/tagout removal procedure have been conducted and certified through inspection and verification. Government or Utility locks and tags used to support the Contractor's work will not be removed until the authorized Government employee receives the formal notification.

## 3.5 FALL PROTECTION PROGRAM

Establish a fall protection program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify roles and responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with EM 385-1-1, Chapter 21.

### 3.5.1 Fall Protection Equipment and Systems

Enforce use of personal fall protection equipment and systems designated (to include fall arrest, restraint, and positioning) for each specific work activity in the Site Specific Fall Protection and Prevention Plan and AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Chapter 21-4.

Provide personal fall protection equipment, systems, subsystems, and

components that comply with EM 385-1-1 and 29 CFR 1926.

#### 3.5.1.1 Additional Personal Fall Protection Measures

In addition to the required fall protection systems, other protective measures such as safety skiffs, personal floatation devices, and life rings, are required when working above or next to water in accordance with EM 385-1-1, Chapter 21-8.t. Personal fall protection systems and equipment are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall protection systems are required when operating other equipment such as scissor lifts. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, travel, or while performing work.

#### 3.5.1.2 Personal Fall Protection Equipment

Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. The use of body belts is not acceptable. Harnesses must have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Snap hooks and carabineers must be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions and have a minimum gate strength of 1633 kg in all directions. Use webbing, straps, and ropes made of synthetic fiber. The maximum free fall distance when using fall arrest equipment must not exceed 1.8 m, unless the proper energy absorbing lanyard is used. Always take into consideration the total fall distance and any swinging of the worker (pendulum-like motion), that can occur during a fall, when attaching a person to a fall arrest system. Equip all full body harnesses with Suspension Trauma Preventers such as stirrups, relief steps, or similar in order to provide short-term relief from the effects of orthostatic intolerance in accordance with EM 385-1-1, Chapter 21-8.t.

## 3.6 SCAFFOLDING ACCEPTED ALTERNATIVE

The Commander, POJ, has determined that there are adequate provisions provided under the Government of Japan Ordinance to achieve the required protections for supported metal scaffolding employed as part of contracted activities provided for U.S. Army Corps of Engineers (USACE) within the locality of Japan. Reference POJ-SO decision memorandum, subject, Alternate Requirement Analysis - Scaffolding Standards Review, dated 24 September 2019.

This determination only includes supported metal scaffolding structures and does not include other forms of scaffolding methods included in EM 385-1-1, Chapter 22.

JISHA requirements for steel scaffolding structures to conform to the Japanese Industrial Standard JIS A 8951 are comparable to those of ANSI/ASSP A10.8, providing sufficient protection required to achieve the provisions of EM 385-1-1, Chapter 22.

## 3.7 RIGGING ACCEPTED ALTERNATIVE

The Commander, POJ, has determined that there are adequate provisions provided under the Government of Japan (GOJ) Ordinance, which warrant a partial acceptance for rigging procedures and rigging equipment, employed

as part of contracted activities provided for USACE within the locality of Japan. Reference POJ-SO decision memorandum, subject, Alternate Requirement Analysis - Rigging Requirements and Procedures, dated 15 January 2020.

This acceptance excludes Multiple Lift Rigging (MLR) procedures as well as standards for all hooks used for lifting or load handling purposes. MLR and hooks used for load handling purposes will adhere to the respective sections of the EM 385-1-1, Chapter 15 without exception.

Accepted standards include, JISHA ORDINANCE NO. 34, "The Safety Ordinance for Cranes", Chapter VIII Sling Work, Section 1 Slinging Equipment Articles 213-220. Also referenced, is the JISHA's "Guideline for sling work safety (2000)".

## 3.8 EXCAVATIONS

Soil classification shall be performed by a competent person in accordance with EM 385-1-1, Chapter 25.

### 3.8.1 Excavations and Trenching Accepted Alterative

The Commander, POJ, has determined that there are adequate provisions provided under the Government of Japan Ordinance to achieve the required protections for excavation and trenching systems including shoring, shielding, and engineered designed systems employed as part of contracted activities provided for USACE within the locality of Japan. Reference POJ-SO decision memorandum, subject, Alternate Requirement Analysis - Excavation and Trenching Review, dated 7 November 2019.

This determination only includes excavation and trenching systems including shoring, shielding, and engineered designed systems where the manufactures or a registered professional engineer's tabulated data has been employed.

Provisions within JISHA ORDINANCE NO. 47, Articles 368-371 provide sufficient protection required to achieve the provisions of EM 385-1-1, Chapter 25-2, paragraph j (25-2.j). JISHA ORDINANCE NO. 47 instructions included in Articles 368-371 conform with the provisions for manufactured shoring/shielding and engineered designed support systems including material serviceability, structural design, and erection/installation. These provisions provided sufficient protection required to achieve the provisions of EM 385-1-1, Chapter 25-2, paragraph j (25-2.j).

### 3.8.2 Utility Locations

The Contractor shall positively identify underground utilities in the work area and coordinate with the installation utility department. The Contractor shall obtain digging permits prior to start of excavation by contacting the Contracting Officer at least fifteen (15) calendar days in advance.

### 3.8.3 Utility Location Verification

The Contractor shall scan the construction site with electromagnetic or sonic equipment, and mark the surface of the ground where existing underground utilities are discovered. Verify the elevations of existing piping, utilities, and any type of underground or encased obstruction not indicated to be specified or removed, but indicated or discovered during

scanning in locations to be traversed by piping, ducts, and other work to be conducted or installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made. Physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within one meter of the underground system.

### 3.8.4 Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

Utilities located within and under concrete slabs or pier structures, bridges, parking areas, and the like, are extremely difficult to identify. Whenever Contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with installation utility departments in addition to location and depth verification by the Contractor. The Contractor shall locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the Contractor from meeting this requirement.

### 3.8.5 Munitions and Explosives of Concern (MEC)

Munitions and Explosives of Concern (MEC): Unexploded Ordinance (UXO), Material Presenting a Potential Explosive Hazard (MPPEH), Chemical Agents (CA), or Discarded Military Munitions (DMM) on jobsites shall be treated as extremely dangerous and must be reported immediately. Follow the 3Rs: RECOGNIZE, RETREAT, and REPORT.

#### 3.8.5.1 Identification and Notification

If you encounter or suspect you have encountered MEC, the on-site supervisor shall immediately suspend all operations put at risk due to the suspected MEC identified. STOP WORK, and DO NOT TOUCH, mark the location, keep people out of the area, and report to the Government Designated Authority. Project personnel will withdraw along cleared path upwind 300 meters from the discovery or as determined by emergency responders.

The on-site supervisor shall contact the installation emergency services who will intern contact the appropriate Explosives Ordinance Disposal (EOD) unit. EOD will determine the threat and mitigate any immediate explosives hazard(s).

Where suspected MEC are encountered during construction operations and other activities, notify the Contracting Officer's Representative/Contracting Officer immediately. If no hazard is present or poses no danger, the Government will direct the Contractor to proceed without change after given the all clear from the emergency responders. If MEC are found the condition or probability of encountering MEC may also change. The responsible government authority will conduct a new probability assessment, this determination will be used to plan the level of support required and determine further requirements. Pursuant to FAR 52.243-4, "Changes" the Government may issue a modification.

## 3.9 EQUIPMENT

### 3.9.1 Use of Explosives

Explosives must not be used or brought to the project site.

## 3.10 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1, Chapters 11 and 12.

### 3.10.1 Electrical Work

As described in EM 385-1-1, electrical work is to be conducted in a de-energized state unless there is no alternative method for accomplishing the work. In those cases obtain an energized work permit from the Contracting Officer. The energized work permit application must be accompanied by the AHA and a summary of why the equipment/circuit needs to be worked energized. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Attach temporary grounds in accordance with ASTM F855 and IEEE 1048. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator is allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method.

When working in energized substations, only qualified electrical workers are permitted to enter. When work requires work near energized circuits as defined by NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety footwear, insulating gloves and electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA. Ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910and 29 CFR 1926.

#### 3.10.1.1 Energized Electrical Work Permit (EEWP)

All equipment and circuits must be placed into an Establishing an Electrically Safe Working Condition (ESWC) must be de-energized before work is started unless energized work can be justified. A QP must complete and verify the following to establish electrically safe working condition in accordance with EM 385-1-1, paragraph 11-8.d unless the work meets the EEWP exemption located under EM 385-1-1, paragraph 11-8.e(5) or the host employer or system owner can show that there are additional hazards or an increased risk from de-energizing.

Hazardous Energy: Any energy including but not limited to mechanical (for example, power transmission apparatus, counterbalances, springs, pressure, gravity), pneumatic, hydraulic, electrical, stored electrical energy exists such as Uninterrupted Power Systems (UPS), chemical, nuclear, and thermal (for example, high or low temperature) energies, which could cause injury to employees.

Once it has been determined that equipment must be worked on in an energized condition, an EEWP must be submitted to the USACE supervisor/KO

or COR and AHJ for acceptance. Do not perform energized work without prior authorization. All permits must be prepared, signed, and authorized in advance of performing any electrical work. A non-mandatory ENG Form 6277 (Energized Electrical Work Permit) is provided in EM 385-1-1, Chapter 11-10.

### 3.10.2 Qualifications

Electrical work must be performed by QP with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and must be identified in the appropriate AHA. Journeyman/Apprentice ratio must be in accordance with Host Nation requirements applicable to where work is being performed.

### 3.10.3 Arc Flash

Conduct a hazard analysis/arc flash hazard analysis whenever work on or near energized parts greater than 50 volts is necessary, in accordance with NFPA 70E.

All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, no Unqualified Person is permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

### 3.10.4 Grounding

Ground electrical circuits, equipment and enclosures in accordance with NFPA 70 and IEEE C2 to provide a permanent, continuous and effective path to ground unless otherwise noted by EM 385-1-1.

### 3.10.5 Testing

Temporary electrical distribution systems and devices must be inspected, tested and found acceptable for Ground-Fault Circuit Interrupter (GFCI) protection, polarity, ground continuity, and ground resistance before initial use, before use after modification and at least monthly. Monthly inspections and tests must be maintained for each temporary electrical distribution system, and signed by the electrical CP or QP.

-- End of Section --

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U.S. Army Corps of Engineers (USACE)

# ACCIDENT PREVENTION PLAN (APP)

For use of this form, see EM 385-1-1; the proponent agency is CESO.

**Purpose:** An APP is a written site-specific Safety & Occupational Health plan that documents project, contract, and job-specific potential hazards in the workplace, and the company policies, controls, and work practices that will be used to minimize those hazards. They are an integral part of the planning and risk management process. The APP must be developed by a Competent Person and reviewed and approved by the prime contractor and corporate safety official. Upon contractor approval, the plan must be submitted to the Contracting Officer (KO) or Contracting Officer Representative (COR) for review and acceptance prior to the performance of any work. No contract work can begin without a KO or COR accepted APP.

The completed APP must be posted on the SOH bulletin board, or a notice posted on the board stating the location of the plan.

## PART 1 - SIGNATURES

**Plan Preparer - For example: Qualified Person (QP), Competent Person (CP), or project Quality Control (QC).**

| | |
|---|---|
| 1. Name: | 2. Title: |
| 3. Email Address: | 4. Phone Number: |
| 5. Signature | |

**Plan Approver - Corporate Safety Official**

| | |
|---|---|
| 1. Name: | 2. Title: |
| 3. Email Address: | 4. Phone Number: |
| 5. Signature | |

**Plan Concurrence - For example: Industrial hygienist, Project Manager, Superintendent, Site Safety & Health Officer, Quality Control, etc.**

| | |
|---|---|
| 1. Name: | 2. Title: |
| 3. Email Address: | 4. Phone Number: |
| 5. Signature: | |

## PART 2: PROJECT INFORMATION

| | |
|---|---|
| 1. Project Name: | |
| 2. Project Address (attach map in Appendix 1): | |
| 3. Estimated Project Start Date: | 4. Estimated Project Completion Date: |
| 5. Project Description / Description of work to be performed: | |

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## PART 3: PRIME CONTRACTOR INFORMATION

1. Prime Contractor Name:

2. Contract Number:

3. Project Manager Name:

4. Quality Control (QC) Manager Name:

5. Contractor Corporate Safety Official Name:

6. Primary Site Safety & Health Officer (SSHO) Name:

7. Alternate Site Safety & Health Officer (SSHO) Name(s):

## PART 4: SOH COMMITMENT AND POLICY

1. Provide a statement of safety and health policy detailing commitment to providing a safe and healthful workplace for all employees on this project.

2. Provide a statement outlining the Contractor's safety program goals and objectives.

3. Identify policies and procedure regarding non-compliance with safety requirements.

4. Provide written procedures for holding managers and supervisors accountable for safety.

| | | |
|---|---|---|
| 5. Prime contractor is responsible for the implementation and enforcement of the SOH program for contractor employees, subcontractors, suppliers, and visitors at the site of work? | ☐ Yes | ☐ No |
| 6. Prime contractor will require subcontractors, suppliers, and visitors to comply with the APP and EM 385-1-1? | ☐ Yes | ☐ No |
| 7. No work will be performed unless a designated SSHO is present on the site of work. | ☐ Yes | ☐ No |
| 8. A list of all known subcontractor(s) and supplier(s) are listed in Appendix 2. | ☐ Yes | ☐ No |
| 9. If all subcontractor(s) and supplier(s) are not known at the time of initial APP submittal, Appendix 2 will be updated and resubmitted to the KO/COR for acceptance prior to the start of any work activities. | ☐ Yes | ☐ No |
| 10. All subcontractors will have a copy of the APP, applicable AHAs and will be required to comply with them. | ☐ Yes | ☐ No |
| 11. Subcontractors and suppliers at the site of work will abide by the EM 385-1-1, this APP, and all AHAs. | ☐ Yes | ☐ No |
| 12. This APP and AHAs will be available to all workers at the site of work. | ☐ Yes | ☐ No |

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## PART 5: TRAINING

| | | |
|---|---|---|
| 1. All employees will be trained according to applicable EM 385-1-1, federal, state, and local requirements prior to the commencement of work. | ☐ Yes | ☐ No |

2. The following personnel are identified and designated as personnel responsible for SOH on this project. Add the following documentation to Appendix 3 of this worksheet: 1) SSHO designation letter (ENG Form 6282), 2) instructor signed OSHA 30-hour card (or course completion certificate if within 90 days of having completed the OSHA 30-hour training), and 3) proof of 24 hours of competency of SOH training within the last 3 years for the personnel identified below. (EM 385-1-1, Chapter 2, 2-3 Personnel Qualification/Training):
(Check and list names of personnel being designated)

☐ Primary SSHO Name:

☐ Alternate SSHO Name(s):

3. QP(s) and CP(s) required by EM 385-1-1 (for example, excavation, confined space, scaffolding, fall protection, etc.) for this project will be included in Appendix 3. Include 1) List of names or designation letters and 2) proof of qualification/competency.

## PART 6: SOH INSPECTIONS

| | | |
|---|---|---|
| 1. All applicable inspections required by EM 385-1-1, contract, federal, state, and local requirements will be completed. | ☐ Yes | ☐ No |

2. The following personnel are assigned to conduct inspections, the type of inspection and frequency for the worksite. At minimum the SSHO must conduct daily site inspections.

| Who will conduct inspection? | Frequency? | What type of inspection? |
|---|---|---|
| + - | | |

| | | |
|---|---|---|
| 3. Employees that conduct inspections will have technical proficiency needed to perform inspections. Proof of inspector's training/qualification is included in Appendix 3. | ☐ Yes | ☐ No |
| 4. Deficiencies will be documented and tracked as required by this EM 385-1-1? | ☐ Yes | ☐ No |

6. Will any external inspections be required (for example, USCG, OSHA, etc.)? ☐ Yes ☐ No
If yes, describe:

## PART 7: ACCIDENT REPORTING AND INVESTIGATION

| | | |
|---|---|---|
| 1. Exposure data (man-hours worked) will be reported to KO/COR as required by the contract? | ☐ Yes | ☐ No |
| 2. All accidents will be reported as soon as possible according to EM 385-1-1? | ☐ Yes | ☐ No |
| 3. All accidents occurring incidentally to an operation, project, or facility for which the EM 385-1-1 is applicable will be thoroughly investigated and analyzed. Corrective actions to prevent reoccurrence will be implemented as soon as reasonably possible. The KO/COR will be notified when corrective actions are completed. | ☐ Yes | ☐ No |
| 4. Accident notification will be provided to the KO/COR as stated below: | ☐ Yes | ☐ No |

| ACCIDENT TYPE | KO/COR NOTIFICATION TIME |
|---|---|
| Fatality, permanent and partial disability, or property damage over $600,000 | Immediately, no later than (NLT) 8 hours |
| All other accidents and near misses | Immediately, NLT 24 hours |

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| PART 8: SOH OVERSIGHT | | |
|---|---|---|
| 1. A risk management process that meets or exceeds the requirement of the EM 385-1-1 will be implemented on this project site? | ☐ Yes | ☐ No |
| 2. Hazardous conditions and unsafe acts will be immediately corrected? | ☐ Yes | ☐ No |
| 3. APP and AHAs will be prepared by a QP or CP according to the EM 385-1-1 prior to the start of any work activities on the site of work (as much as the information can be known at that point in time). | ☐ Yes | ☐ No |
| 4. The plans and AHAs will be updated throughout the life of the project to include changes in personnel, equipment, conditions, etc. Additional revisions must be incorporated as necessary to reflect changing site conditions, construction methods, personnel roles and responsibilities and construction schedules. | ☐ Yes | ☐ No |
| 5. No activity/work will be started at the site of work until the APP is reviewed and submitted to the KO/COR for acceptance, with the site-specific plans and procedures required by the EM 385-1-1 to complete the project? | ☐ Yes | ☐ No |
| 6. APP and AHAs will be provided to and reviewed by all workers involved in the activity prior to work? | ☐ Yes | ☐ No |
| 7. Workers will sign AHA(s) to concur with identified job steps and controls needed to mitigate hazards? | ☐ Yes | ☐ No |
| **PART 9: SEVERE WEATHER PLAN** | | |
| 1. The SSHO or designated onsite personnel is responsible for checking the weather conditions at a minimum of twice a day? | ☐ Yes | ☐ No |

2. What severe weather forecast will require the SSHO to monitor weather conditions continuously? Describe.

3. What are the training requirements for severe weather precautions and actions?

4. Identify area of retreat or other actions to be taken such as evacuation, shelter in place, etc.

5. Identify procedures to stop outdoor activities if extreme weather conditions to include thunderstorms are in the area.

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## PART 10: ACTIVITY HAZARD ANALYSIS (RISK MANAGEMENT)

1. Major phases of work anticipated:

2. Definable Features of Work (DFOW)

*Note*. An activity-specific AHA will be submitted to the KO/COR for each DFOW prior to any work being performed.

3. List equipment to be used:

4. Anticipated High-Risk Activities: (See examples below, check all that apply):

- ☐ Electrical and/or Hazardous Energy
- ☐ Working at Heights
- ☐ Scaffolding
- ☐ Diving
- ☐ Load Handling Equipment
- ☐ Occupational Exposure
- ☐ Confined Space
- ☐ Excavations & Trenching
- ☐ Other:
- ☐ Other:
- ☐ Other:
- ☐ Other:

| | | |
|---|---|---|
| 5. Detailed project-specific hazards and controls will be provided utilizing AHAs for each activity/DFOW. | ☐ Yes | ☐ No |
| 6. No work will begin on an activity/DFOW until the initial AHA addressing the project-specific hazards has been developed, reviewed, and accepted by the KO/COR. (See EM 385-1-1 Chapter 2 section 2-6). | ☐ Yes | ☐ No |
| 7. AHAs are living documents and are intended to be created, utilized in the field, and updated (by the workers) as necessary. | ☐ Yes | ☐ No |
| 8. Workers/crews will have accepted AHA(s) that reflects current site conditions, personnel, equipment, control measures, etc. while the work is being performed? | ☐ Yes | ☐ No |
| 9. AHA will be used by the contractor personnel to assure work is being performed consistent with the AHA? | ☐ Yes | ☐ No |
| 10. Once the activity has been completed, the AHA will be available and kept onsite for the length of the contract. | ☐ Yes | ☐ No |
| 11. AHAs for unknown work activities will be submitted to the KO/COR prior to work and attached to Appendix 4 of this document. | ☐ Yes | ☐ No |

12. Who has the authority to accept residual risk on AHA(s)? (List below)

| Category of Risk | Approval Authority (Name and Title) |
|---|---|
| Extremely High Risk | |
| High Risk | |
| Medium Risk | |
| Low Risk | |

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## PART 11: REQUIRED PROJECT SITE-SPECIFIC PLANS AND PROCEDURES

| | | |
|---|---|---|
| 1. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the contractor will ensure that all applicable SOH risks and associated compliance plans are in place. | ☐ Yes | ☐ No |
| 2. Include all project-specific compliance plans, as applicable to the work being performed, and as identified below. The plans will incorporate project-wide procedures to control hazards to which the employees of all project employers may be exposed. | ☐ Yes | ☐ No |
| 3. These plans and procedures will be coordinated with all project employers and be included in project-specific emergency response and evacuation procedures. | ☐ Yes | ☐ No |

4. Address each of the plans in the outline below in the order that they are listed.
Option 1: If a plan is applicable, develop and attach it to Appendix 5. Submit to the KO/COR with this worksheet for acceptance prior to work.
Option 2: If a plan is applicable, but all of the minimum required information for the plan is not yet known, provide justification next to each plan title, and provide an expected date the plan will be created, reviewed, and attached to Appendix 5. Submit to the KO/COR with this worksheet for acceptance prior to work.
Option 3: If a plan is not applicable because of the nature of the work to be performed, provide justification next to each plan title.

| Minimum plans required by EM 385-1-1 | Reference EM 385-1-1 paragraph: | Select Option | Justification for Option 2 and Option 3 |
|---|---|---|---|
| Exposure Control Plan | 3-7.a | | |
| AED Program | 3-7.b | | |
| Construction Site Plan | 4-7.a | | |
| Access/Haul Road Plan | 4-7.b | | |
| Hearing Conservation Program | 5-7.a | | |
| Respiratory Protection Program | 5-7.b | | |
| Hazard Communication (HazCom) Program | 6-7.a | | |
| Process Safety Management (PSM) Program | 6-7.b | | |
| Lead Compliance Plan | 6-7.c | | |
| Asbestos Management Plan | 6-7.d | | |
| Ionizing Radiation Safety Plan | 6-7.e | | |
| Radiofrequency Plan | 6-7.e | | |
| Abrasive Blasting Plan | 6-7.f | | |
| Thermal Stress Management Plan | 6-7.g | | |
| Mold Remediation Plan | 6-7.h | | |
| Silica Compliance Plan | 6-7.i | | |
| Fatigue Management Plan | 6-7.j | | |
| Night Operations Lighting Plan | 7-7 | | |
| Traffic Control Plan | 8-7 | | |
| Fire Prevention Plan | 9-7.a | | |
| Wildland Fire Management Plan | 9-7.b | | |
| Housekeeping Plan (Welding and Cutting) | 10-7 | | |
| Electrical Safety Plan | 11-7.a | | |
| Assured Equipment Grounding Conductor Program | 11-7.b | | |
| Site-Specific Energy Control Plan | 12-7.a | | |
| Standard Lift Plan | 16-7.a & b | | |

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| | | | |
|---|---|---|---|
| Standard Lift Plan (Floating Plant) | 16-7.a & c | | |
| Critical Lift Plan | 16-7.a & d | | |
| Pile Driving Plan | 16-7.a & e | | |
| Structural Demolition Plan | 17-7 | | |
| Soft Demolition Plan | 17-7 | | |
| Emergency Plan for Marine Activities | 19-7.a | | |
| Severe Weather Plan for Marine Activities | 19-7.b | | |
| Float Plans | 19-7.c | | |
| Tow Plans | 19-7.d | | |
| Fall Protection and Prevention Plan | 21-7.a | | |
| Rescue Plan | 21-7.b | | |
| Scaffold Work Plan | 22-7.b | | |
| Rope Access Work Plan | 23-7 | | |
| Excavation and Trenching Plan | 25-7 | | |
| Compressed Air Work Plan | 26-7.a & b | | |
| Contingency Response Plan | 26-7.a & c | | |
| Emergency Rescue Plans and Equipment | 26-7.a & d | | |
| Ventilation and Dust Control Plan | 26-7.a & e | | |
| Fire Prevention and Protection Plan | 26-7.a & f | | |
| Formwork and Shoring Plan | 27-7.a | | |
| Precast Concrete Plan | 27-7.b | | |
| Masonry Erection Plan | 27-7.c | | |
| Steel Erection Plan | 28-7 | | |
| Explosive Site Safety Plan | 29-7.a | | |
| Master Blasting Plan | 29-7.b | | |
| Vibration Monitoring Plan | 29-7.c | | |
| Safe Practices Plan | 30-7.a & b | | |
| Dive Operations Plan | 30-7.a & c | | |
| Emergency Management Manual | 30-7.a & d | | |
| Snorkeling Plan | 30-7.a & e | | |
| Tree Maintenance and Removal Plan | 31-7 | | |
| Construction Safety and Phasing Plan | 32-7.a | | |
| Safety Plan Compliance Document | 32-7.b | | |
| Aviation Pre-Accident Plan | 33-7.f | | |
| Confined Space Plan | 34-7.b & c | | |
| Housekeeping Plan (Sanitation) | 35-7.a | | |
| Extermination Plan | 35-7.b | | |
| Site Safety and Health Plan | 36-7.a | | |
| Comprehensive Work Plan | 36-7.b | | |
| Emergency Response Plan | 36-7.c | | |

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## PART 12: PROJECT SITE COORDINATION

1. Provide procedures for coordinating SOH activities with other employers on the site of work:

## PART 13: REQUIRED APPENDICES

**Indicate if each of the following items are, or are not, attached to this plan.**

| | | |
|---|---|---|
| Appendix 1. Project Map | ☐ Yes | ☐ No |
| Appendix 2. Subcontractor/Suppliers | ☐ Yes | ☐ No |
| Appendix 3. Personal Qualifications and Designations | ☐ Yes | ☐ No |
| Appendix 4. Activity Hazard Analysis | ☐ Yes | ☐ No |
| Appendix 5. Site-specific plans and procedures | ☐ Yes | ☐ No |
| Appendix 6. Any additional plans, procedures, etc. can be added to this appendix and will be coordinated with the KO/COR. | ☐ Yes | ☐ No |

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

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1.2 ORDERING INFORMATION

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section Table of Contents --

# SECTION 01 42 00

# SOURCES FOR REFERENCE PUBLICATIONS

## PART 1 GENERAL

### 1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g. ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

### 1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AACE INTERNATIONAL (AACE)
1265 Suncrest Towne Centre Drive
Morgantown, WV 26505-1876 USA
Ph: 304-296-8444
Fax: 304-291-5728
E-mail: info@aacei.org
Internet: http://www.aacei.org

ACOUSTICAL SOCIETY OF AMERICA (ASA)
1305 Walt Whitman Road, Suite 300
Melville, NY 11747-4300
Ph: 516-576-2360
Fax: 631-923-2875
E-mail: asa@aip.org
Internet: http://asa.aip.org

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: amca@amca.org
Internet: http://www.amca.org

ALUMINUM ASSOCIATION (AA)
National Headquarters
1525 Wilson Boulevard, Suite 600
Arlington, VA 22209
Ph: 703-358-2960

E-Mail: info@aluminum.org
Internet: http://www.aluminum.org

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173-4268
Ph: 847-303-5664
Fax: 847-303-5774
E-mail: customerservice@aamanet.org
Internet: http://www.aamanet.org

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: http://www.concrete.org

AMERICAN FOREST FOUNDATION (AFF)

2000 M Street, NW
Suite 550
Washington, DC 20036
Ph: 202-765-3660
Email: info@forestfoundation.org
Internet: https://www.forestfoundation.org/

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)
3141 Fairview Park Dr, Suite 777
Falls Church, VA 22042
Tel: 703-849-8888
Fax: 703-207-3561
E-mail: infonet@aiha.org
Internet http://www.aiha.org

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802
Ph: 312-670-2400
Fax: 312-670-5403
Bookstore: 800-644-2400
E-mail: aisc@ware-pak.com
Internet: http://www.aisc.org

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
P.O. Box 210
Germantown, MD 20875-0210
Ph: 301-972-1700
Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: http://www.alsc.org

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1899 L Street, NW,11th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: storemanager@ansi.org

Internet: http://www.ansi.org/

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191
Ph: 703-295-6300; 800-548-2723
E-mail: member@asce.org
Internet: http://www.asce.org

THE SOCIETY OF HEATING, AIR-CONDITIONING AND SANITARY ENGINEERS OF JAPAN (SHASE)
4 Chome-8 Kagurazaka
Shinjuku-ku, Tokyo 162-0825
Ph: 81-3-5206-3600
FAX: 81-3-5206-3603
Internet: http://www.shasej.org/

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

520 N. Northwest Highway
Park Ridge, IL 60068
Ph: 847-699-2929
E-mail: customerservice@assp.org
Internet: https://www.assp.org/

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 800-527-4723 or 404-636-8400
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: http://www.ashrae.org

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018
Ph: 847-699-2929
Internet: http://www.asse.org

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 West Quincy Avenue
Denver, CO 80235-3098
Ph: 303-794-7711
E-mail: distribution@awwa.org
Internet: http://www.awwa.org

AMERICAN WELDING SOCIETY (AWS)
13301 NW 47 Ave
Miami, FL 33054
Ph: 888-WELDING, 305-824-1177, 305-826-6192
Fax: 305-826-6195
E-mail: customer.service@awspubs.com
Internet: http://www.aws.org

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077

Fax: 205-733-4075
Internet: http://www.awpa.com

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th St.
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
Internet: http://www.apawood.org

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Two Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: http://www.asme.org

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1518 K Street, NW
Washington, DC 20005
Ph: 202-737-0202
Fax: 202-638-4833
E-mail: info@aabc.com
Internet: http://www.aabc.com/

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 877-909-2786
Internet: http://www.astm.org

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue, 15th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
Internet: http://www.buildershardware.com

THE BUILDING CENTER OF JAPAN (BCJ)
1-9 Kanda Nishiki-cho
Chiyoda-ku, Tokyo 101-8986 JAPAN
Ph: 81-3-5283-0479
Fax: 81-3-5281-2822
Internet: http://www.bcj.or.jp

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)
PO Box 997377
MS 0500
Sacramento, CA 95899-7377
Ph: (916) 558-1784
Internet: https://www.cdph.ca.gov/

CARPET AND RUG INSTITUTE (CRI)
P.O. Box 2048
Dalton, GA 30722-2048
Ph: 706-278-3176

Fax: 706-278-8835
Internet: http://www.carpet-rug.com

COMPOSITE PANEL ASSOCIATION (CPA)
19465 Deerfield Avenue, Suite 306
Leesburg, VA 20176
Ph: 703-724-1128
Fax: 703-724-1588
Internet: http://www.compositepanel.org/

COMPRESSED GAS ASSOCIATION (CGA)
14501 George Carter Way, Suite 103
Chantilly, VA 20151-1788
Ph: 703-788-2700
Fax: 703-961-1831
E-mail: cga@cganet.com
Internet: http://www.cganet.com

CSA GROUP (CSA)
178 Rexdale Blvd.
Toronto, ON, Canada M9W 1R3
Ph: 416-747-4044
Fax: 416-747-2510
E-mail: sales@csagroup.org
Internet: http://www.csagroup.org/us/en/home

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)

1600 Pennsylvania Ave NW
Washington, DC 20500
Itnernet: https://www.whitehouse.gov/ceq/

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)
P.O. BOX 10055
HYATTSVILLE, MD 20782*8055
INTERNET:https://www.fema.gov/

FM GLOBAL (FM)
270 Central Avenue
P.O. Box 7500
Johnston, RI 02919-4923
Ph: 877-364-6726
Fax: 401-275-3029
E-mail: servicedesk.myrisk@fmglobal.com
Internet: http://www.fmglobal.com

FOREST STEWARDSHIP COUNCIL (FSC)
212 Third Avenue North
Suite 445
Minneapolis, MN 55401
Ph: 612-353-4511
E-mail: info@us.fcs.org
Internet: https://us.fsc.org/

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)
University of South California
Research Annex 219
3716 South Hope Street

Los Angeles, CA 90089-7700
Ph: 213-740-2032 or 866-545-6340
Fax: 213-740-8399
E-mail: fccchr@usc.edu
Internet: http://www.usc.edu/dept/fccchr

GREEN SEAL (GS)
1001 Connecticut Avenue, NW
Suite 827
Washington, DC 20036-5525
Ph: 202-872-6400
Fax: 202-872-4324
Internet: http://www.greenseal.org

GYPSUM BOARD ASSOCIATION OF JAPAN (GRAJ)
2-13-10 Nishi-Shimbashi
Minato-ku, Tokyo 105-0003
Ph: 03-3591-6774
Fax: 03-3591-1567
Email:info@gypsumboard-a.or.jp
Internet: http://www.gypsumboard-a.or.jp/

ICC EVALUATION SERVICE, INC. (ICC-ES)
3060 Saturn Street, Suite 100
Brea, CA 92821
Ph: 800-423-6587 ext. 66546
Fax: 562-695-4694
E-mail: es@icc-es.org
Internet: http://www.icc-es.org

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
445 and 501 Hoes Lane
Piscataway, NJ 08854-4141
Ph: 732-981-0060 or 800-701-4333
Fax: 732-562-9667
E-mail: onlinesupport@ieee.org
Internet: http://www.ieee.org

INSTITUTE OF INSPECTION, CLEANING, AND RESTORATION CERTIFICATION (IICRC)
IICRC Headquarters
4317 NE Thurston Way, Suite 200
Vancouver, WA 98662
Ph: 360-693-5675
Fax: 360-693-4858
E-mail: info@iicrc.org
Internet: http://www.iicrc.org/home

INTELLIGENCE COMMUNITY STANDARD (ICS)
OFFICE OF DIRECTOR OF NATIONAL INTELLIGENCE
WASHINGTON, DC 20511
PH: 703-733-8600
INTERNET:HTTPS://WWW.DNI.GOV/INDEX.PHP

INTERNATIONAL CAST POLYMER ASSOCIATION (ICPA)
4949 Old Brownsboro Rd, Ste. 232
Louisville, KY 40222
Ph: 470-219-8139
Internet: https://theicpa.com/

INTERNATIONAL CODE COUNCIL (ICC)
500 New Jersey Avenue, NW
6th Floor, Washington, DC 20001
Ph: 800-786-4452 or 888-422-7233
E-mail: order@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
3050 Old Centre Ave. Suite 102
Portage, MI 49024
Ph: 269-488-6382
Internet: http://www.netaworld.org

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1, ch. de la Voie-Creuse
Case Postale 56
CP 56 - CH-1211 Geneva 20
Switzerland
Ph: 41-22-749-01-11
Fax: 41-22-733-34-30
E-mail: central@iso.ch
Internet: http://www.iso.org

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)
1901 North Moore Street
Arlington, VA 22209-1762
Ph: 703-525-1695
Fax: 703-528-2148
Internet: http://www.safetyequipment.org/

JAPAN ADHESIVE INDUSTRY ASSOCIATION (JAIA)
2nd Floor, Maruishi Building
10-4 Kajicho 1-Chome
Chiyoda-ku, Tokyo 101-0044 JAPAN
Ph: 81-3-3251-3360
Fax: 81-3-3251-3380
Internet: http://www.jaia.gr.jp

JAPAN CAST IRON COVER & WASTE FITTING ASSOCIATION (JCW)
1-64-11 Akabane, Kita-ku,
Tokyo 115-0045, Japan
Ph/Fax: 03-3901-3690
Internet: http://www.jcw.jp/

JAPAN DUCTILE IRON PIPE ASSOCIATION (JDPA)
4-chome-8-9 Kudanminami
Chiyoda-ku, Tokyo 102-0074
Ph: 81-3-3264-6655
FAX: 81-3-3264-5075
Interne: https://www.jdpa.gr.jp/index.html

THE JAPAN ELECTRICAL MANUFACTURERS' ASSOCIATION (JEMA)
17-4 Ichibancho
Chiyoda-ku, Tokyo 102-0082 JAPAN
Ph: 81-3-3556-5881
Internet: www.jema-net.or.jp

JAPAN ELECTRICAL SAFETY INSPECTION ASSOCIATIONS
Shintoranomon Jitsugyokaikan 9F, 1-1-21 Toranomon
Minato-ku, Tokyo, JAPAN 105-0001
TEL:81-3-3581-2104
FAX:81-3-3581-5967
Email : info@denki-hoan.org
Internet: http://denkihoan.org/en/

JAPAN MINISTRY OF THE ENVIRONMENT(MOE)
Godochosha No. 5, 1-2-2 Kasumigaseki
Chiyoda-ku, Tokyo 100-8975 JAPAN
Ph: 81-3-3581-3351
E-mail: https//www.env.go.jp/en/moemail/
Internet: http://www.env.go.jp

JAPAN PIPE FITTINGS ASSOCIATION (JPFA)
8F 3-14-6 KYOBASHI,
CHUO-KU, TOKYO, 104-0031 JAPAN
Ph: 81-3-3564-2035
Internet: http://www.tsugite.jp

JAPAN POWER CABLE ACCESSORIES ASSOCIATION STANDARDS (JCAA)
2-20-6 Nihonbashi Hama-cho
Chuo-ku Tokyo 103-0007, Japan
Phone:81-3-3808-0750
Fax:81-3-3808-0854
Email: jcaasecr@ppp.star-net.or.jp
Internet:http://www.jpcaa.or.jp/e_p3.html

JAPAN SEWAGE WORKS ASSOCIATION (JSWAS)
2-chome-10-12 Uchikanda
Chiyoda-ku Tokyo 101-0047
Ph: 81-3-6206-026
FAX: 81-3-6206-0265
Internet: https://www.jswa.jp/

JAPAN VALVE MANUFACTURERS' ASSOCIATION
5th Floor, Kikai-Shinko Bldg. 3-5-8 Shiba-Koen
Minato-Ku, Tokyo 105-0011, Japan
Ph: +81-3-3434-1811
Fax: +81-3-3436-4335
Internet: https://j-valve.or.jp

JAPAN WATER WORKS ASSOCIATION (JWWA)
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Chiyoda-ku, Tokyo 102-0074 JAPAN
Ph: 81-3-3264-2307
Fax: 81-3-3264-2306
E-mail: kokusai@jwwa.or.jp
Internet: http://www.jwwa.or.jp

JAPANESE ELECTROTECHNICAL COMMITTEE (JEC)
Email: iec@iee.or.jp
Internet: https://www.iee.jp/jec/

JAPANESE GEOTECHNICAL SOCIETY (JGS)
4-38-2 Sengoku
Bunkyo-ku, Tokyo, 112-0011, Japan
Ph: +81-3-3946-8677
Fax: +81-3-3946-8678
E-mail: jgs@jiban.or.jp
Internet: https://www.jiban.or.jp/e/

JAPAN ROAD ASSOCIATION (JRA)
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Internet: http://www.mlit.go.jp/en/index.html

MLIT MECHANICAL STANDARD SPECIFICATION
2-1-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8918 JAPAN
Ph: 81-3-5253-8111
Internet: http://www.mlit.go.jp/en/index.html

NATIONAL AIR DUCT CLEANERS ASSOCIATION (NADCA)
15000 Commerce Parkway, Suite C
Mt. Laurel, NJ 08054
Toll Free: 855-GO-NADCA
Ph: (856) 380-6810
Fax: (856) 439-0525
E-mail: info@nadca.com
Internet: http://www.nadca.com

NATIONAL ASSOCIATION OF MOLD REMEDIATORS AND INSPECTORS (NAMRI)
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
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Rosemont, IL 60018-5607
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Fax: 847-299-1183
E-mail: info@nrca.net
Internet: http://www.nrca.net

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)
272 Tuttle Road
Cumberland, ME 04021
Ph: 207-829-6901
Fax: 207-829-4293
E-mail: info@nelma.org
Internet: http://www.nelma.org

NSF INTERNATIONAL (NSF)
789 North Dixboro Road
P.O. Box 130140
Ann Arbor, MI 48105
Ph: 734-769-8010 or 800-NSF-MARK
Fax: 734-769-0109
E-mail: info@nsf.org
Internet: http://www.nsf.org

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)
2, rue André Pascal

75016 Paris FRANCE
Internet: https://www.oecd.org

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
800 Roosevelt Road
Building C, Suite 312
Glen Ellyn, IL 60137
Ph: 630-858-6540
Fax: 630-790-3095
Internet: http://www.ppfahome.org

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

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Ph: +41 22 799 4540
Fax: +41 22 799 4550
E-mail: info@pefc.org
Internet: https://www.pefc.org/

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Internet: http://www.scsglobalservices.com/

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
4201 Lafayette Center Drive
Chantilly, VA 20151-1219
Ph: 703-803-2980
Fax: 703-803-3732
Internet: http://www.smacna.org

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)
21865 Copley Drive
Diamond Bar, CA 91765
Ph: 909-396-2000
E-mail: webinquiry@aqmd.gov
Internet: http://www.aqmd.gov

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Pensacola, FL 32504-0915
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Internet: https://www.sdsfieonline.org

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Washington, DC 20037
Ph: 202-596-3450
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Internet: https://forests.org

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)
15 Technology Parkway South, Suite 115
Peachtree Corners, GA 30092
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U.S. DEPARTMENT OF ENERGY (DOE)
1000 Independence Avenue Southwest
Washington, D.C. 20585
Internet: www.eere.energy.gov

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
451 7th Street S.W.
Washington, DC 20410
Ph: 202-708-1112
Internet: https://www.hud.gov/

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Internet: http://www.gpoaccess.gov

UNDERWRITERS LABORATORIES (UL)
2600 N.W. Lake Road
Camas, WA 98607-8542
Ph: 877-854-3577
E-mail: CEC.us@us.ul.com
Internet: http://www.ul.com/
UL Directories available through IHS at http://www.ihs.com

UL SOLUTIONS (UL)
2600 N.W. Lake Road
Camas, WA 98607-8542
Ph: 877-854-3577
E-mail: CEC.us@us.ul.com
Internet: http://www.ul.com/
UL Directories available through IHS at http://www.ihs.com

VIBRATION ISOLATION AND SEISMIC CONTROL MANUFACTURERS ASSOCIATION (VISCMA)
994 Old Eagle School Road Suite 1019
Wayne, PA 19087-1866
Ph: 610-971-4850
Internet: http://www.viscma.com

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
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Fax: 503-684-8928
E-mail: info@wclib.org
Internet: http://www.wclib.org

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
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Portland, OR 97201
Ph: 503-224-3930
Fax: 503-224-3934
E-mail: info@wwpa.org
Internet: http://www.wwpa.org

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
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Chicago, IL 60611
Ph: 312-321-6802
E-mail: wdma@wdma.com
Internet: http://www.wdma.com

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)
507 First Street
Woodland, CA 95695
Ph: 530-661-9591 or 800-550-7889
Fax: 530-661-9586
E-mail: info@wmmpa.com
Internet: http://www.wmmpa.com

PART 2 PRODUCTS (NOT USED)

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METRIC MEASUREMENTS

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# SECTION 01 42 15

# METRIC MEASUREMENTS

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM SI10 | (2010) American National Standard for Use of the International System of Units (SI): The Modern Metric System |

### 1.2 GENERAL

This project includes metric units of measurements. The metric units used are the International System of Units (SI) developed and maintained by the General Conference on Weights and Measures (CGPM); the name International System of Units and the international abbreviation SI were adopted by the 11th CGPM in 1960. The following criteria allow both metric and English inch-pound (I-P) measurements to be shown for a product:

a. To subsitute products that are manufactured to an industry recognized rounded metric (hard metric) dimension with I-P products.

b. To indicate industry and/or Government standards, test values or other controlling factors (such as the code requirements where I-P values are needed for clarity).

c. To trace back to the referenced standard(s), test value(s) or code(s).

### 1.3 USE OF MEASUREMENTS IN DRAWINGS AND SPECIFICATIONS

Measurements in drawings and specifications shall be in SI units, with I-P units in parenthesis in cases as indicated in Paragraph GENERAL and as otherwise authorized by the Contracting Officer. Procure the product in SI units unless otherwise authorized by the Contracting Officer. The Contractor is responsible for all associated labor and materials when authorized to substitute one system of units for another and for the final assembly and performance of the specified work and/or products.

#### 1.3.1 Hard Metric

Hard metric measurements are often used for field data such as distance from one point to another or distance above the floor. Products are considered to be hard metric when they are manufactured to metric dimensions or have an industry recognized metric designation.

#### 1.3.2 Soft Metric

a. A soft metric measurement is a non-mathematical, industry related

conversion. Soft metric measurements are used for measurements pertaining to products, test values, and other situations where the I-P units are the standard for manufacture, verification, or other controlling factor.

b. A soft metric measurement is also indicated for products that are manufactured in industry designated metric dimensions but are required by law to allow substitute I-P products.

1.3.3 Neutral

A neutral measurement is indicated by an identifier which has no expressed relation to either an SI or an I-P value (e.g., American Wire Gage (AWG) which indicates thickness but in itself is neither SI nor I-P).

1.4 COORDINATION

Bring discrepancies, such as mismatches or product unavailability, arising from use of both metric and non-metric measurements and discrepancies between the measurements in the specifications and the measurements in the drawings to the attention of the Contracting Officer for resolution.

1.5 RELATIONSHIP TO SUBMITTALS

Submittals for Government approval or for information only covers the SI products actually being furnished for the project. Submit the required drawings and calculations in the same units used in the Contract documents describing the product or requirement unless otherwise instructed or approved. Use ASTM SI10 as the basis for establishing metric measurements required to be used in submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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**11/16**

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QUALITY CONTROL
**11/16**

PART 1 GENERAL

1.1 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, all associated costs shall be included in the applicable CLIN Schedule unit or job prices.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G

SD-06 Test Reports

Verification Statement

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system that complies with FAR 52.246-12 Inspection of Construction. QC consist of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all construction operations, both onsite and offsite, and be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CONTRACTOR QUALITY CONTROL (CQC) PLAN

Submit no later than 15 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements FAR 52.246-12 Inspection of Construction. Include the submittal register with CQC Plan submissions. The Government will consider

an interim plan for the first 14 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional work.

### 3.2.1 Content of the CQC Plan

Include, as a minimum, the following to cover all construction-operations, both onsite and offsite, including work by subcontractors fabricators, suppliers and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent if the CQC System Manager and project superintendent are separate persons.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Furnish copies of these letters to the Contracting Officer.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer are required to be used.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of the specifications can generally be considered as a definable feature of work, there are

frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

### 3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in the Contractor Quality Control(CQC) Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.3 Notification of Changes

After acceptance of the CQC Plan, notify the Contracting Officer in writing a minimum of seven (7) days prior of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

## 3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer and discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 15 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations,, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and the Contracting Officer and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

## 3.4 QUALITY CONTROL ORGANIZATION

### 3.4.1 Personnel Requirements

The requirements for the CQC organization are a Site Safety and Health Officer (SSHO), CQC System Manager, and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The SSHO reports directly to a senior project (or corporate) official independent from the CQC System Manager. The SSHO will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

### 3.4.2 CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. This CQC System Manager is on the site at all times during construction and is employed by the prime Contractor. CQC System Manager cannot have other duties assigned. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager. The CQC System Manager shall report to the assigned Project Manager. Refer to Section 01 11 00.00 10 GENERAL CONTRACT REQUIREMENTS, Paragraph "Contractor Quality Control System Manager" for experience requirements.

### 3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the required areas listed in Section 01 11 00.00 10 GENERAL CONTRACT REQUIREMENTS, Paragraph "Contractor Quality Control Personnel". These individuals or specialized technical companies must be responsible to the CQC System Manager; must be physically present at the construction site during work on the specialized personnel's areas of responsibility; must have the necessary education or experience in accordance with the experience matrix listed herein. The table below defines only the qualification requirements. Refer to the Section 01 11 00.00 10 GENERAL CONTRACT REQUIREMENTS, Paragraph "Contractor Quality Control Personnel" for actual required personnel.

| Experience Matrix | |
|---|---|
| Area | Qualifications |
| Civil | Graduate of an accredited university with an Civil Engineering or Construction Manager degree with 3 years experience in the type of work being performed on this project or technician with 5 yrs related experience. Or Non-US degree plus 1 Kyu Doboku Sekou Kanrigishi (1st Class Civil Engineering Works Management Engineer). |
| Mechanical | Graduate of an accredited university with an Mechanical Engineer degree with 3 years experience or person with 5 years of experience supervising mechanical features of work in the field with a construction company. Or Non-US degree plus 1 Kyu Kankouji Sekou Kanrigishi (1st Class Building Mechanical and Electrical Engineer). |

| Experience Matrix | |
|---|---|
| Area | Qualifications |
| Electrical | Graduate of an accredited university with an Electrical Engineering degree with 3 years related experience or person 5 years of experience supervising electrical features of work in the field with a construction company. Or Non-US degree plus 1 Kyu Kankouji Sekou Kanrigishi (1st Class Building Mechanical and Electrical Engineer) or 1 Kyu Denkikouji Sekou Kanrigishi (1st Class Electric Construction Management Engineer). |
| Structural | Graduate of an accredited university with an Civil Engineering degree (with Structural Track or Focus) or Construction Management degree with 3 years experience or technician 5 years of experience supervising structural features of work in the field with a construction company. Or Non-US degree plus 1 Kyu Kenchikushi (1st Class Qualified Architect) or 1 Kyu Kenchiku Sekou Kanrigishi (1st Class Building Construstion Managemnet Engineer). |
| Architectural | Graduate of an accredited university with an Architecture degree with 3 years experience or person with 5 years related experience. Or Non-US degree plus 1<br>Kyu Kenchikushi (1st Class Qualified Architect) or 1 Kyu Kenchiku Sekou Kanrigishi (1st Class Building Construction Management Engineer). |
| Fire Protection | Registered U.S. Professional Engineer who has passed the fire protection<br>engineering written examination administered by the National Council of<br>Examiners and Surveying (NCEES) and has a minimum of four (4) years of<br>relevant fire protection engineering experience. |
| Submittals | Submittal Clerk with 1 year experience |
| Concrete, Pavements and Soils | Materials Technician with 2 years experience for the appropriate area |
| Testing, Adjusting and Balancing (TAB) Personnel | Specialist must be a member of AABC or an experienced technician of the firm certified by the NEBB |

### 3.4.4 Site Safety and Health Officer (SSHO)

See Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMNTS.

### 3.4.5 Additional Requirement

In addition to the above experience and education requirements, the Contractor Quality Control(CQC) System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Contractors course. If the CQC System Manager does not have a current certification, obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

The Construction Quality Management Training certificate expires after 5 years. If the CQC System Manager's certificate has expired, retake the course to remain current.

### 3.4.6 Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

## 3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, have to comply with the requirements in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING is included the submittals required by those sections must be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

## 3.6 CONTROL

CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:

### 3.6.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

a. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

b. Review of the Contract drawings.

c. Check to assure that all materials and equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.

g. Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

h. Review of the appropriate activity hazard analysis to assure safety requirements are met.

i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

k. Discussion of the initial control phase.

l. The Government needs to be notified at least 72 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

### 3.6.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

a. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing are in compliance with the contract.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government needs to be notified at least 24 hours in advance of beginning the initial phase for definable feature of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with follow-up phases.

g. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

### 3.6.3 Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

### 3.6.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

## 3.7 TESTS

### 3.7.1 Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance tests when specified. Procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

### 3.7.2 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

## 3.8 COMPLETION INSPECTION

### 3.8.1 Punch-Out Inspection

Conduct an inspection of the work by the CQC System Manager near the end of the work, or any increment of the work established by a time stated in FAR 52.211-10 Commencement, Prosecution, and Completion of Work. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

### 3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative is required to be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands can also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the Contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance FAR 52.246-12 Inspection of Construction.

## 3.9 DOCUMENTATION

### 3.9.1 Quality Control Activities

Maintain current records providing factual evidence that required quality control activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

a. The name and area of responsibility of the Contractor/Subcontractor.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and control activities performed with results and references to specifications/drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.

g. Offsite surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and specifications.

### 3.9.2 Verification Statement

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the Contractor Quality Control(CQC) System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report.

## 3.10 SAMPLE FORMS

Sample forms can be obtained from the Resident Office or found through Contractor link of the RMS website http://rms.usace.army.mil.

## 3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

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RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE (RMS CM)

**11/16**

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SECTION 01 45 00.15 10

RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE (RMS CM)
**11/16**

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

## 1.2 MEASUREMENT AND PAYMENT

The work of this section is not measured for payment. The Contractor is responsible for the work of this section, without any direct compensation other than the payment received for contract items.

## 1.3 CONTRACT ADMINISTRATION

The Government will use the Resident Management System (RMS) to assist in its monitoring and administration of this contract. The Government accesses the system using the Government Mode of RMS (RMS GM) and the Contractor accesses the system using the Contractor Mode (RMS CM). The term RMS will be used in the remainder of this section for both RMS GM and RMS CM. The joint Government-Contractor use of RMS facilitates electronic exchange of information and overall management of the contract. The Contractor accesses RMS to record, maintain, input, track, and electronically share information with the Government throughout the contract period in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Closeout
Import/Export of Data

### 1.3.1 Correspondence and Electronic Communications

For ease and speed of communications, exchange correspondence and other documents in electronic format to the maximum extent feasible. Some correspondence, including pay requests and payrolls, are also to be provided in paper format with original signatures. Paper documents will govern, in the event of discrepancy with the electronic version.

### 1.3.2 Other Factors

Other portions of this document have a direct relationship to the

reporting accomplished through RMS. Particular attention is directed to FAR 52.236-15 Schedules for Construction Contracts; FAR 52.232-27 Prompt Payment for Construction Contracts; FAR 52.232-5 Payments Under Fixed-Priced Construction Contracts; Section 01 32 01.00 10 PROJECT SCHEDULE; Section 01 33 00 SUBMITTAL PROCEDURES; Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS; and Section 01 45 00.00 10 QUALITY CONTROL.

## 1.4 RMS SOFTWARE

RMS is a Windows-based program that can be run on a Windows-based PC meeting the requirements as specified in paragraph SYSTEM REQUIREMENTS. Download, install and be able to utilize the latest version of the RMS software within 7 calendar days of receipt of the Notice to Proceed. RMS software, user manuals, access and installation instructions, program updates and training information are available from the RMS website ( https://rms.usace.army.mil). The Government and the Contractor will have different access authorities to the same contract database through RMS. The common database will be updated automatically each time a user finalizes an entry or change.

## 1.5 SYSTEM REQUIREMENTS

The following is the recommended system configuration to run the Contractor Mode RMS for full utilization of all features for all types and sizes of contracts. Smaller, less complicated, projects may not require the configuration levels described below. Required configuration also noted below.

| Recommended RMS System Requirements | |
|---|---|
| Hardware | |
| Windows-based PC | 1.7 GHz i3; AMD A6 3650 GHz or higher processor (REQUIRED) |
| RAM | 8 GB |
| Hard drive disk | 100 GB space for sole use by RMS system |
| Monitor | Screen resolution 1366 x 768 |
| Mouse or other pointing device | |
| Windows compatible printer | Laser printer must have 4 MB+ of RAM |
| Connection to the Internet | minimum 4 Mbs per user |
| Software | |
| MS Windows | Windows 10 x 64 bit (RMS requires 64 bit O/S) or newer (REQUIRED) |
| Word Processing software | Viewer for MS Word 2013, MS Excel 2013 or newer (REQUIRED) |
| E-mail | MAPI compatible (REQUIRED) |

| Recommended RMS System Requirements | |
|---|---|
| Virus protection software | Regularly upgraded with all issued Manufacturer's updates and is able to detect most zero day viruses (REQUIRED) |

## 1.6 CONTRACT DATABASE - GOVERNMENT

The Government will enter the basic contract award data in RMS prior to granting the Contractor access. The Government entries into RMS will generally be related to submittal reviews, correspondence status, and Quality Assurance(QA)comments, as well as other miscellaneous administrative information.

## 1.7 CONTRACT DATABASE - CONTRACTOR

Contractor entries into RMS establish, maintain, and update data throughout the duration of the contract. Contractor entries generally include prime and subcontractor information, daily reports, submittals, RFI's, schedule updates and payment requests. RMS includes the ability to import attachments and export reports in many of the modules, including submittals. The Contractor responsibilities for entries in RMS typically include the following items:

### 1.7.1 Administration

#### 1.7.1.1 Contractor Information

Enter all current Contractor administrative data and information into RMS within 7 calendar days of receiving access to the contract in RMS. This includes, but is not limited to, Contractor's name, address, telephone numbers, management staff, and other required items.

#### 1.7.1.2 Subcontractor Information

Enter all missing subcontractor administrative data and information into RMS CM within 7 calendar days of receiving access to the contract in RMS or within 7 calendar days of the signing of the subcontractor agreement for agreements signed at a later date. This includes name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor is listed separately for each trade to be performed.

#### 1.7.1.3 Correspondence

Identify all Contractor correspondence to the Government with a serial number. Prefix correspondence initiated by the Contractor's site office with "S". Prefix letters initiated by the Contractor's home (main) office with "H". Letters are numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C" or "RFP".

#### 1.7.1.4 Equipment

Enter and maintain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment

inspection dates.

1.7.1.5 Reports

Track the status of the project utilizing the reports available in RMS. The value of these reports is reflective of the quality of the data input. These reports include the Progress Payment Request worksheet, Quality Control (QC) comments, Submittal Register Status, and Three-Phase Control worksheets.

1.7.1.6 Request For Information (RFI)

Create and track all Requests For Information (RFI) in the RMS Administration Module for Government review and response.

1.7.2 Finances

1.7.2.1 Pay Activity Data

Develop and enter a list of pay activities in conjunction with the project schedule. The sum of pay activities equals the total contract amount, including modifications. Each pay activity must be assigned to a Contract Line Item Number (CLIN). The sum of the activities assigned to a CLIN equals the amount of each CLIN.

1.7.2.2 Payment Requests

Prepare all progress payment requests using RMS. Update the work completed under the contract at least monthly, measured as percent or as specific quantities. After the update, generate a payment request and prompt payment certification using RMS. Submit the signed prompt payment certification and payment request as well as supporting data either electronically or by hard copy. Unless waived by the Contracting Officer, a signed paper copy of the approved payment certification and request is also required and will govern in the event of discrepancy with the electronic version.

1.7.3 Quality Control (QC)

Enter and track implementation of the 3-phase QC Control System, QC testing, transferred and installed property and warranties in RMS. Prepare daily reports, identify and track deficiencies, document progress of work, and support other Contractor QC requirements in RMS. Maintain all data on a daily basis. Insure that RMS reflects all quality control methods, tests and actions contained within the Contractor Quality Control (CQC) Plan and Government review comments of same within 7 calendar days of Government acceptance of the CQC Plan.

1.7.3.1 Quality Control (QC) Reports

The Contractor's Quality Control (QC) Daily Report in RMS is the official report. The Contractor can use other supplemental formats to record QC data, but information from any supplemental formats are to be consolidated and entered into the RMS QC Daily Report. Any supplemental information may be entered into RMS as an attachment to the report. QC Daily Reports must be finalized and signed in RMS within 24 hours after the date covered by the report. Provide the Government a printed signed copy of the QC Daily Report, unless waived by the Contracting Officer.

1.7.3.2 Deficiency Tracking.

Use the QC Daily Report Module to enter and track deficiencies. Deficiencies identified and entered into RMS by the Contractor or the Government will be sequentially numbered with a QC or QA prefix for tracking purposes. Enter each deficiency into RMS the same day that the deficiency is identified. Monitor, track and resolve all QC and QA entered deficiencies. A deficiency is not considered to be corrected until the Government indicates concurrence in RMS.

1.7.3.3 Three-Phase Control Meetings

Maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS. Worksheets for the three-phase control meetings are generated within RMS.

1.7.3.4 Labor and Equipment Hours

Enter labor and equipment exposure hours on a daily basis. Roll up the labor and equipment exposure data into a monthly exposure report.

1.7.3.5 Accident/Safety Reporting

Both the Contractor and the Government enter safety related comments in RMS as a deficiency. The Contractor must monitor, track and show resolution for safety issues in the QC Daily Report area of the RMS QC Module. In addition, follow all reporting requirements for accidents and incidents as required in EM 385-1-1, Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS and as required by any other applicable Federal, State or local agencies.

1.7.3.6 Definable Features of Work

Enter each feature of work, as defined in the approved CQC Plan, into the RMS QC Module. A feature of work may be associated with a single or multiple pay activities, however a pay activity is only to be linked to a single feature of work.

1.7.3.7 Activity Hazard Analysis

Import activity hazard analysis electronic document files into the RMS QC Module utilizing the document package manager.

1.7.4 Submittal Management

Enter all current submittal register data and information into RMS within 7 calendar days of receiving access to the contract in RMS. The information shown on the submittal register following the specification Section 01 33 00 SUBMITTAL PROCEDURES will already be entered into the RMS database when access is granted. Group electronic submittal documents into transmittal packages to send to the Government, except very large electronic files, samples, mock ups, color boards, or where hard copies are specifically required. Track transmittals and update the submittal register in RMS on a daily basis throughout the duration of the contract. Submit hard copies of all submittals unless waived by the Contracting Officer.

### 1.7.5 Schedule

Enter and update the contract project schedule in RMS by either manually entering all schedule data or by importing the Standard Data Exchange Format (SDEF) file, based on the requirements in Section 01 32 01.00 10 PROJECT SCHEDULE.

### 1.7.6 Closeout

Closeout documents, processes and forms are managed and tracked in RMS by both the Contractor and the Government. Ensure that all closeout documents are entered, completed and documented within RMS.

## 1.8 IMPLEMENTATION

Use of RMS as described in the preceding paragraphs is mandatory. Ensure that sufficient resources are available to maintain contract data within the RMS system. RMS is an integral part of the Contractor's required management of quality control.

## 1.9 MONTHLY COORDINATION MEETING

Update the RMS CM database each workday. At least monthly, generate and submit one schedule update. At least one week prior to submittal, meet with the Government representative to review the planned progress payment data submission for errors and omissions.

Make required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will not be accepted. The Government will not process progress payments until all required corrections are processed.

## 1.10 NOTIFICATION OF NONCOMPLIANCE

Take corrective action within 7 calendar days after receipt of notice of RMS non-compliance by the Contracting Officer.

# PART 2 PRODUCTS

Not Used

# PART 3 EXECUTION

Not Used

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# SECTION 01 50 00

# TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

| | |
|---|---|
| AWWA C511 | (2007) Standard for Reduced-Pressure Principle Backflow Prevention Assembly |

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

| | |
|---|---|
| FCCCHR List | (continuously updated) List of Approved Backflow Prevention Assemblies |
| FCCCHR Manual | (10th Edition) Manual of Cross-Connection Control |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 241 | (2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations |
| NFPA 70 | (2023) National Electrical Code |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
|---|---|
| PL 93-523 | (1974; A 1999) Safe Drinking Water Act |

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

| | |
|---|---|
| FAA AC 70/7460-1 | (2016; Rev L; Change 2) Obstruction Marking and Lighting |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan; G
Traffic Control Plan; G
Temporary Utility Connections Plan; G

## 1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

## 1.4 BACKFLOW PREVENTERS CERTIFICATE

Certificate of Full Approval from FCCCHR List, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

### 1.4.1 Backflow Tester Certificate

Certification issued by the local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with any company participating in any other phase of this Contract.

### 1.4.2 Backflow Prevention Training Certificate

Certification recognized by the local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

## 1.5 TYPHOON AND STORM PREPARATIONS

In order to minimize damage to public properties and prevent personal injury, the following actions shall be taken upon declaration of the typhoon conditions described below. Ensure that the construction sites are well-prepared for protection from the damages of heavy rain and strong winds. Develop and establish the necessary procedures to be taken for storm preparation. In Part 1 of the Accident Prevention Plan, provide emergency phone numbers and addresses where at least three Contractor officials may be reached and notified in the event that an immediate typhoon alert is declared.

### 1.5.1 Tropical Cyclone Conditions of Readiness (TCCOR)

a. TCCOR STORM WATCH: The winds are not forecast to exceed 50 knots (58 mph/26 m/s) sustained (the criteria for "destructive winds") but there still exists a probability of high winds due to the proximity of the storm. High winds may include gusts exceeding 50 knots and/or sustained winds meeting TCCOR 1 Caution criteria. The storm is also close enough to the area that a heightened alert status is necessary in order to rapidly establish elevated TCCOR conditions should the storm deviate from the forecast track. Personnel should follow

Standard Operating Procedures for TCCOR Storm Watch and stay alert for any changes to TCCOR status.

When wind gusts of 30 knots (35 mph/16 m/s) or greater are forecast, the Contractor shall be required to perform general area cleanup and monitor TCCOR levels.

When a local storm warning has been issued, the Contractor competent person and/or SSHO shall determine whether it is necessary to implement manufacturer recommendations for securing the equipment to include Weight Handling Equipment (WHE).

Contractor reviews project site storm preparation plans and discuss plan of action with Contracting Officer's Representative.

b. TCCOR 4: Winds of 50 knots (58 mph/26 m/s) sustained or greater are possible within 72 hours.

When wind gusts of 30 knots (35 mph/16 m/s) or greater are forecast, the Contractor will be required to perform general area cleanup and monitor TCCOR levels.

Cranes shall not be operated when wind speeds at the site attain the maximum wind velocity based on the surface/load ratio recommendations of the manufacturer.

At winds greater than 20 mph (17 knots/9 m/s), the operator, rigger, lift supervisor, and SSHO shall cease all crane operations, evaluate conditions and determine if the lift can proceed with Contracting Officer's Representative acceptance.

All elevated work above 6 ft (1.8 m) shall be risk assessed by the Contractor's competent person and/or SSHO and discussed with the Contracting Officer's Representative for acceptance.

c. TCCOR 3: Winds of 50 knots (58 mph/26 m/s) sustained or greater are possible within 48 hours.

(1) Clean and remove all loose debris and waste including scrap wood and metal, empty barrels, and construction form materials no longer required on the job site, to a safe area for proper disposition.

(2) Secure, tie down, and anchor construction field office and storage facilities, scaffolding, concrete forms and supports, doors, windows, opening covers, stored lumber and other materials, mechanized construction equipment, temporary power lines and supports, and other items that may be blown away or that might cause injury or damage.

(3) Inspect all excavation and trenching work in process, and provide necessary temporary drainage and proper protection and shoring for excavation sides and openings, in order to prevent damage to public roads and facilities by slides or flooding. Accumulation of water in the excavation of structure foundation work shall be controlled and minimized.

(4) Inspect scaffolding or work platforms for loose materials, planking, etc. that could become airborne projectile hazards and

secure scaffold netting, tarps, etc. from wind loads.

d. TCCOR 2: Winds of 50 knots (58 mph/ 26 m/s) sustained or greater are possible within 24 hours.

Work required at remote areas such as off-shore facilities or high elevations shall cease immediately and the workers shall be evacuated to a safe area. During TCCOR 2, the Contractor shall continue the actions described in TCCOR 3 above and the construction site shall be inspected for storm preparation by the Contracting Officer's Representative. The Contractor shall request an inspection by calling the Contracting Officer's Representative at the appropriate Japan Engineer District field office.

e. TCCOR 1: Winds of 50 knots (58 mph/26 m/s) sustained or greater are possible within 12 hours.

All work shall cease immediately and the Contractor's representative shall insure that all necessary storm preparations, including the items listed below, are completed.

(1) All electrical circuits and equipment including temporary power lines are cut off and secured against unauthorized use.

(2) Gas cylinders, hot work equipment, and flammable materials properly stored at a safe area.

(3) No igniting source is present.

(4) All workers have been evacuated from the construction site. When TCCOR 1 is declared without the normal progression through TCCOR 3 and/or 2, the Contractor shall take the actions listed in TCCOR 3 above, and also follow the procedures described herein.

f. TCCOR 1 Caution: Winds of 35 to 49 knots (39/17 to 56/25 mph/ m/s) sustained are occurring.

Construction Sites Secured.

g. TCCOR 1 Emergency: Winds of 50 knots (58 mph/26 m/s) sustained or greater are occurring.

Construction Sites Secured.

h. TCCOR 1 Recovery: Winds of 50 knots (58 mph/26 m/s) sustained or greater are no longer forecast to occur. Strong winds may still exist.

Installation personnel begin storm damage assessments and clean up.

i. TCCOR Storm Clear: The storm is over and not forecast to return. Used to inform personnel that the threat of the storm is over, but the storm damage could still present a danger.

Contractor may resume normal activities. The construction site shall be investigated for all damage caused by the typhoon or high winds, and the result of the investigation shall be furnished in verbal or written form to the Contracting Officer's Representative as soon as practicable.

Complete and submit PODWP 134 Typhoon Damage Report for storm damages or negative report of damage to Emergency Management, Construction Division, and Safety Office.

j. TCCOR All Clear: The storm is over and not forecast to return, and recovery efforts are complete.

Resume normal activities.

# PART 2 PRODUCTS

## 2.1 TEMPORARY SIGNAGE

### 2.1.1 Bulletin Board

Immediately upon beginning of work, provide a weatherproof glass-covered bulletin board not less than 915 by 1220 mm in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the Contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

### 2.1.2 Project and Safety Signs

Provide one (1) project sign and one (1) safety sign fabricated to size and design as shown in Attachment 01 50 00-A. The signs shall be rigidly formed and erected at location designated by the Contracting Officer prior to commencement of work. A blue-line drawing of different letter sizes and style shall be made available by the Contracting Officer upon request. Prior to painting the sign, submit for approval a sketch, similar to diagram shown in Attachment 01 50 00-A, indicating the actual information for the project. The sketch shall indicate lettering dimensions and locations. The Corps of Engineers castle logo shall be painted red per Attachment 01 50 00-A. Correct the data required by the safety sign daily, with light-colored metallic or non-metallic numerals. No separate payment shall be made for the sign, and all costs in connection therewith shall be included in the Contract price for the project. The sign shall be subject to the approval of the Contracting Officer. Erect signs within 15 days after receipt of the Notice to Proceed. Correct the data required by the safety sign daily, with light-colored metallic or non-metallic numerals. Upon completion of work under this Contract, the signs shall be removed from the job site and shall remain the property of the Contractor.

## 2.2 TEMPORARY TRAFFIC CONTROL

### 2.2.1 Haul Roads

Construct access and haul roads necessary for proper prosecution of the work under this Contract. Construct with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic are to be avoided. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

### 2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic barricades will be required. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

### 2.2.3 Temporary Wiring

Provide temporary wiring in accordance with NFPA 241 and NFPA 70. Include frequent inspection of all equipment and apparatus.

### 2.2.4 Backflow Preventers

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with 65 kg flanged, mounted gate valve and strainer, stainless steel or bronze, internal parts. After installation conduct Backflow Preventer Tests and provide test reports verifying that the installation meets the FCCCHR Manual Standards.

## PART 3 EXECUTION

## 3.1 EMPLOYEE PARKING

Contractor employees will park privately owned vehicles in an area designated by the Contracting Officer. This area shall be within reasonable walking distance of the construction site. Contractor employee parking must not interfere with existing and established parking requirements of the government installation.

## 3.2 TEMPORARY BULLETIN BOARD

Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer.

## 3.3 AVAILABILITY AND USE OF UTILITY SERVICES

### 3.3.1 Payment for Utility Services

The Government shall make all reasonably required utilities available to the Contractor, without charge, from existing outlets and supplies, as specified in the Contract. Carefully conserve any utilities.

### 3.3.2 Meters and Temporary Connections

At the Contractor's expense and in a manner satisfactory to the Contracting Officer, provide and maintain necessary temporary connections, distribution lines, and meter bases required to measure the amount of each utility used. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards. Submit a Temporary Utility Connections Plan for approval to the Contracting Officer, fifteen (15) working days before making temporary utility connections.

The Contractor shall
- Furnish the water meter
- Furnish the electric meter
- Furnish the backflow preventer
- Install the water meter
- Install the electric meter
- Install the backflow preventer

### 3.3.3 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, notify the Contracting Officer, in writing, five working days before termination is desired. A final reading shall be taken by the Government. Afterwards, remove all temporary distribution lines, meter bases, meters, and associated appurtenances.

### 3.3.4 Sanitation

Provide and properly maintain temporary toilet facility for use of Contractor personnel. Government toilet facilities are not available to Contractor personnel. Toilet facility shall be constructed as required in EM 385-1-1 and by local installation regulations, where directed. Include provisions for pest control and elimination of odors. Upon completion of the Contract, dispose facility outside the limits of Government-controlled land and at Contractor's expense.

### 3.3.5 Electricity

The Contractor shall be responsible for all temporary connections required, as well as the removal of these temporary connections upon completion of the project. The Contractor's plan for temporary connections shall be submitted to the Contracting Officer Representative for approval prior to making any temporary connections.

Electrical power system frequencies for different installations are as follows:

60 Hertz (Hz): Marine Corps Air Station Iwakuni, Commander Fleet Activities Sasebo, and all of Okinawa.

### 3.3.6 Telephone and Data

Make arrangements and pay all costs for telephone facilities and data connections.

### 3.3.7 Obstruction Lighting of Cranes

Provide a minimum of 2 aviation red or high intensity white obstruction lights on temporary structures (including cranes) over 30 meter above ground level. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer.

### 3.3.8 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

## 3.4 TRAFFIC PROVISIONS

### 3.4.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic except with written permission of the Contracting Officer at least 30 calendar days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with installation regulations. Coordinate with installation officials. Contractor may move oversized and slow-moving vehicles to the worksite once the requirements of the highway authority have been met. Include a schedule of planned road closures in the Initial Project Schedule.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. At the Contractor's expense, provide, erect, and maintain: lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage overhead protection authority having jurisdiction.

### 3.4.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment, the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

### 3.4.3 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Treat dust abatement on access roads with applications of calcium chloride, water sprinklers, or similar methods or treatment.

## 3.5 CONTRACTOR'S TEMPORARY FACILITIES

### 3.5.1 Safety

Protect the integrity of any installed safety systems or personnel safety devices. If entrance into systems serving safety devices is required, the Contractor must obtain prior approval from the Contracting Officer. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

### 3.5.2 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

### 3.5.3 Temporary Project Safety and Storage Area Fencing

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety and storage area fencing to control access by unauthorized people. Fencing shall be able to restrain a force of at least 114 kg. Safety and storage area fencing shall be 1.8 m high wire mesh fence with lockable gates and visibility screening (similar to tennis court screening) located around the perimeter of project work areas and the perimeter of Contractor lay-down areas. Use plastic panels or perforated steel sheets to improve visibility for vehicular traffic when erecting fencing within 3 meters of street corners. The intent is to block (screen) public view of the construction, and prevent unauthorized access to the site. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Maintain the safety and storage area fencing during the life of the Contract and, upon completion and acceptance of the work, shall become the property of the Contractor and be removed from the work site.

### 3.5.4 Storage Area

Do not place or store trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on any given day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

### 3.5.5 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. Fencing of materials or equipment will be required at this site. The Contractor is responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

### 3.5.6 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on installation property.

### 3.5.7 Maintenance Within Project Boundaries

Keep fencing in a state of good repair and proper alignment. Grassed or

unpaved areas, which are not established roadways, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles; gravel gradation will be at the Contractor's discretion. Mow and maintain grass to a maximum height of 100 mm located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly.

### 3.5.8 Security Provisions

Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment.

### 3.5.9 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

#### 3.5.9.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

## 3.6 GOVERNMENT FIELD OFFICE

The Contractor shall be responsible for providing and maintaining, in good condition, an office for the sole use of Government personnel, in a structure physically separated from the Contractor's site offices. Facility shall be furnished at a location designated and approved by the Contracting Officer, and available for use concurrent with availability of Contractor's site office or within 15 calendar days of Notice to Proceed, whichever occurs first. The office facility, including all furniture, equipment, and connections, shall remain the property of the Contractor and, upon completion of work under this Contract, shall be removed from the site by the Contractor and the site returned as nearly as practical to the original conditions.

Contractor shall provide two designated USACE parking spaces as close to the Government Field Office as practicable. The spaces shall not exceed 50 meters from the field office without written approval from the Contracting Officer.

### 3.6.1 Facility Requirements

Provide the Government an office with a minimum of 67 square meters (720 square feet) in floor area, windows, a door with lockset individually keyed with two keys, and a battery operated smoke detector in each room.

Provide batteries for the smoke detecctors, and replace batteries in each smoke detector at least twice anually.

The walls and ceiling of the office shall be insulated. All windows shall be screened. Windows shall be openable and be securely fastened from the inside. Glass panels in windows shall be protected by bars or heavy mesh screens to prevent easy access to the facility through these panels. The office shall contain a minimum of eight (8) standard electrical outlets meeting local requirements and additionally provide for delivery of a minimum 3,000 Watts.

The office shall contain an integral toilet facility with western-type (with a push-type flush button) toilet fixture (bowl), which shall hold water in it at all times, and a wash basin.

The office facility shall contain a kitchenette type facility with a countertop/work area with a minimum surface area of 55 cm (W) by 150 cm (L). A minimum of two electrical outlets (local current) shall be located adjacent to the countertop.

Hot water for all faucets shall be provided.

### 3.6.2 Furniture and Equipment

Furnish the office with the following furniture and equipment. All furnishing shall be new and manufactured by a recognized supplier of office equipment. All items shall be assembled, installed, and maintained by the Contractor.

a. Two desks (minimum 80 cm by 150 cm) double pedestal with lockable drawers.

b. Two desk chairs with arms: swivel tilt, hydraulic height-adjustable, medium back, fabric covered seat cushion, castored.

c. One conference table (minimum 120 cm by 250 cm), with a minimum of six new arm-chairs, castored.

d. Three file cabinets, capable of holding US letter-size documents, with a minimum five drawers each.

e. Two bookcases with a minimum of five shelves each. Minimum dimensions are 120 cm (W) by 200 cm (H) by 30 cm (D).

f. One clock: wall hung, quartz, 12 dial, battery powered.

g. Plan racks capable of holding two full-size set of Contract plans.

h. One dry-erase board with a minimum dimension of 1.5 m by 1.0 m. Dry erase markers (minimum four different colors) shall be provided and replaced as depleted.

i. One microwave (minimum 0.028 cubic meter).

j. One refrigerator (minimum 0.70 cubic meter).

### 3.6.3 Lighting Requirements

The office facility shall include suitable electric lighting to meet the

minimum lighting requirements (luminance) of administrative areas as indicated in EM 385-1-1.

### 3.6.4 Heating/Cooling Requirements

Provide heating and cooling capable of maintaining an interior temperature of between 16 degrees Celsius and 25 degrees Celsius in all seasons. If applicable, use a fluorocarbon gas refrigerant with an Ozone Depletion Potential (ODP) of less than or equal to 0.05.

### 3.6.5 Drinking Water

Provide potable drinking water for the facility that meets or exceeds PL 93-523.

### 3.6.6 Data Connection

Provide network connectivity (ADSL, Cable or Fiber), one USACE-dedicated router and one switching hub, eight-5 m network cables, and eight power strips.

### 3.6.7 Maintenance

Provide maintenance and janitorial services, to include:

a. Emptying of trash at least twice a week.

b. Cleaning of the office, including the toilet facilities, weekly.

c. Replenishment of liquid soap, toilet paper, and paper towels for daily use. Adequate quantity of these supplies shall be provided on-site and replaced as needed.

### 3.6.8 Security Requirements

The physical security of the Government personnel, property, and field office shall be the responsibility of the Contractor throughout the duration of the Contract.

If the project site is outside of the controlled area of an existing military installation, the Government field office shall have 30 meters of standoff from a fence enclosing the office and all parking or roads. Additional fencing, earth berms, concrete barriers, controlled access points, and similar security features shall be provided to limit access to the site and provide additional building standoff or security.

## 3.7 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor must install a satisfactory means of communication, such as telephone or other suitable devices and made available for use by Government personnel.

## 3.8 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store any salvageable

materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

## 3.9 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and any other temporary products from the site. All tools, equipment, and materials not the property of the Government shall be removed from the premises and properly disposed of off Government property. After removal of trailers, materials, and equipment from within the fenced area, remove the temporary project safety and storage area fencing. Restore areas used by the Contractor for the storage of equipment or material, or other use to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary. Upon completion of the work, notify the Contracting Officer for final inspection.

-- End of Section --

The use of signs to identify Corps managed or supervised design, construction, and rehabilitation projects for military is an important part of efforts to keep the public informed of Corps work. For this purpose, a construction project sign package has been adopted. This package consists of two signs: one for project identification and the other to show on-the-job safety performance of the contractor.

These two signs are to be displayed side by side and mounted for reading by passing viewers. Exact placement location will be designated by the contracting officer's representative.

The panel sizes and graphic formats have been standardized for visual consistency throughout all Corps operations.

Panels are fabricated using HDO plywood or aluminum with dimensional lumber uprights and bracing. The sign faces are nonreflective vinyl.

All legends are to be die-cut or computer-cut in the sizes and typefaces specified and applied to the white panel background following the graphic formats shown on pages 16-2 and 16-3. The Communication Red panel on the left side of the construction project sign with Corps Signature (reverse version) is screen-printed onto the white background.

A display of these two signs is shown on the following two pages. Mounting and fabrication details are provided on page 16-4.

Special applications or situations not covered in these guidelines should be referred to the district Sign Program Manager.

**EP 310-1-6a** (Modified per ECB 2020-1)
**01 Jun 06** (ECB modified 1/31/2020)

## Construction Project Identification Sign

Below is one sample of the Construction Project Identification sign showing how this panel is to identify military projects. The graphic format for this 4'x 6' sign panel follows the legend guidelines and layout as specified below. The large 4'x 4' section of the panel on the right is to be white with black legend.

The 2'x 4' section of the sign on the left with the full Corps Signature (reverse version) is to be screen-printed Communication Red on the white background. The designation of a sponsor in the area indicated is optional with Military construction signs.

This sign is to be placed with the Safety Performance sign shown on the following page. Mounting and fabrication details are provided on page 16-4.

Special applications or situations not covered in these guidelines should be referred to the district Sign Program Manager.

Post size is 4"x4".
Mounting height is 48".

Legend Group 1: One- to two-line description of Corps relationship to project.
Color: White
Typeface: 1.25" Helvetica Regular
Maximum line length: 19"

Legend Group 2: Division or District Name (optional). Placed below 10.5" reverse Signature (6" Castle).
Color: White
Typeface: 1.25" Helvetica Regular

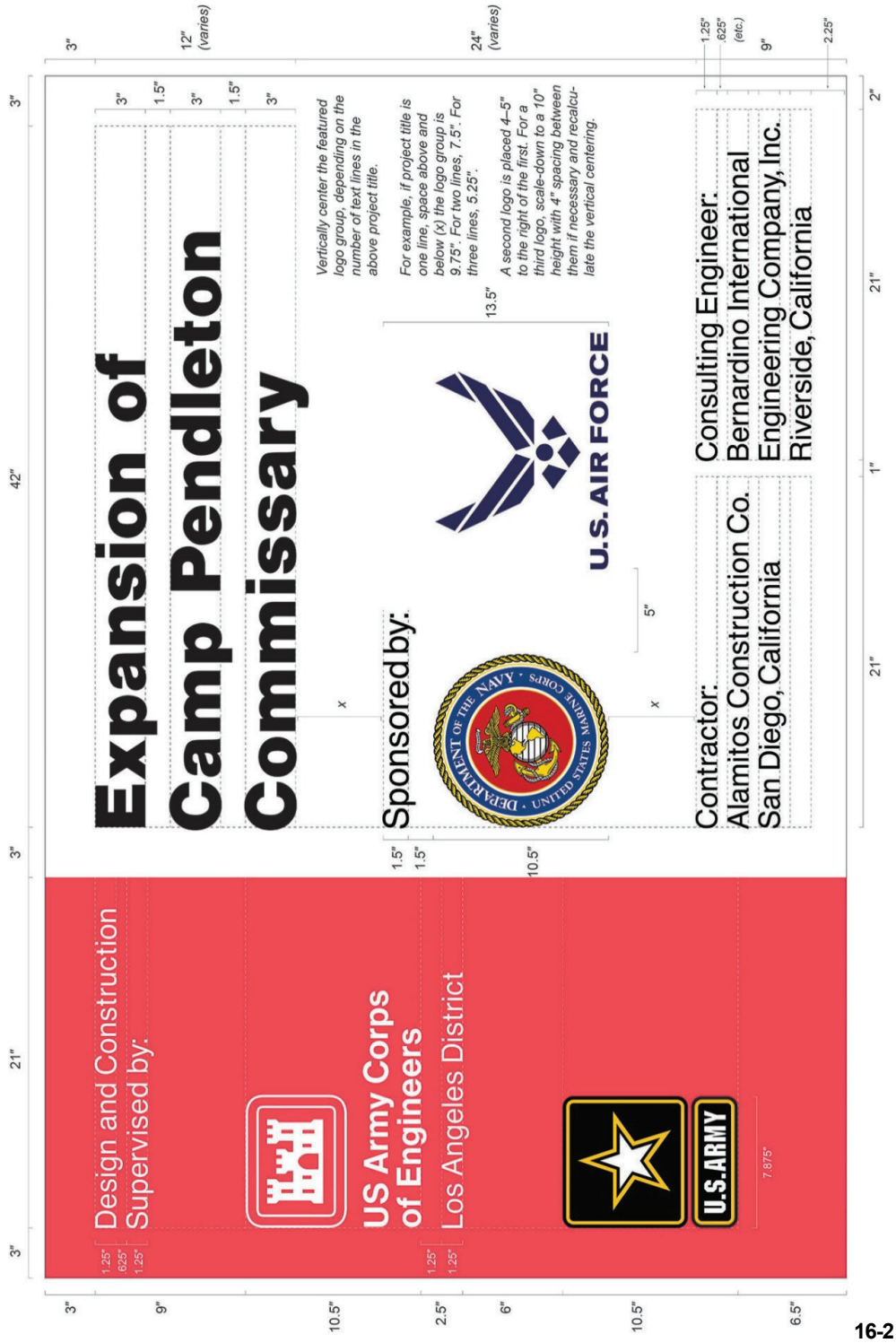
Legend Group 2a: Army Star emblem.
Color: Various

Legend Group 3: One- to three-line project title legend describes the work being done under this contract.
Color: Black
Typeface: 3" Helvetica Bold
Maximum line length: 42"

Legend Group 4: Logo of sponsoring department (military).
Color: Various

Legend Groups 5a-b: One- to five-line identification of prime contractors including: type (architect, general contractor, etc.), corporate or firm name, city, state. Use of Legend Group 5 is optional.
Color: Black
Typeface: 1.25" Helvetica Regular
Maximum line length: 21"

All typography is flush left and rag right, upper and lower case with initial capitals only as shown. Letter- and word-spacing to follow Corps standards as specified in Appendix D.



## Safety Performance Sign

**EP 310-1-6a**
**01 Jun 06**

Each contractor's safety record is to be posted on Corps managed or supervised construction projects and mounted with the Construction Project Identification sign specified on page 16-2.

The graphic format, color, size and typefaces used on the sign are to be reproduced exactly as specified below. The title with First Aid logo in the top section of the sign, and the performance record captions are standard for all signs of this type. Legend groups 2 and 3 below identify the project and the contractor and are to be placed on the sign as shown.

Safety record numbers are mounted on individual metal plates and are screw-mounted to the background to allow for daily revisions to posted safety performance record.

Special applications or situations not covered in these guidelines should be referred to the district Sign Program Manager.

Legend Group 1: Standard two-line title "Safety is a Job Requirement" with 8" (outside diameter) Safety Green first aid logo.
Color: To match Pantone system 347
Typeface: 3" Helvetica Bold
Color: Black

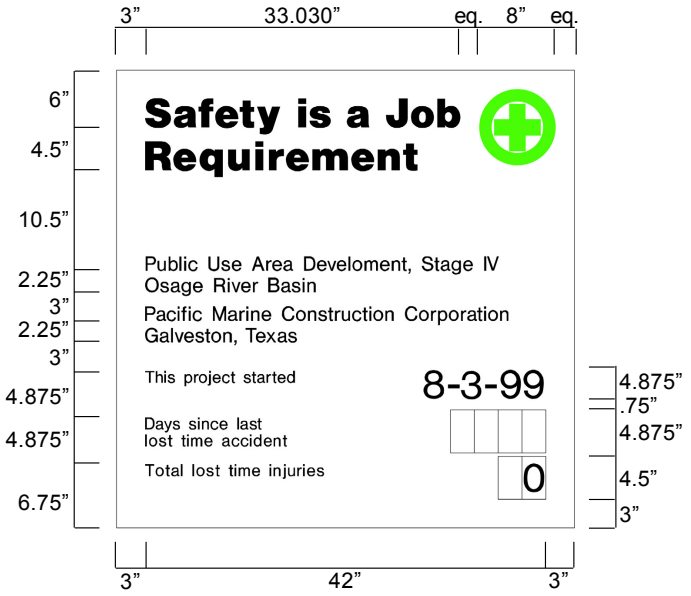
Legend Group 2: One- to two-line project title legend describes the work being done under this contract and name of host project.
Color: Black
Typeface: 1.5" Helvetica Regular
Maximum line length: 42"

Legend Group 3: One- to two-line identification: name of prime contractor and city, state address. Color: Black
Typeface: 1.5" Helvetica Regular
Maximum line length: 42"

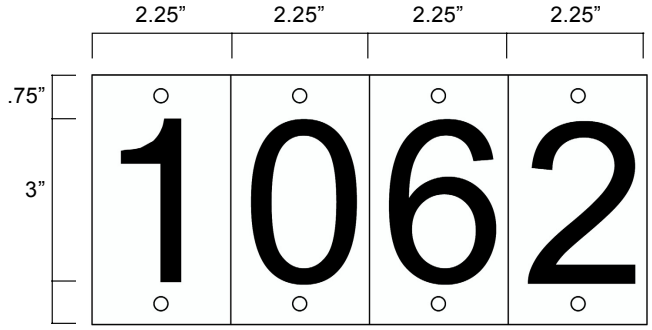
Legend Group 4: Standard safety record captions as shown.
Color: Black
Typeface: 1.25" Helvetica Regular

Replaceable numbers are to be mounted on white .060 aluminum plates and screw-mounted to background.
Color: Black
Typeface: 3" Helvetica Regular
Plate size: 2.5" x 4.5"

All typography is flush left and rag right, upper and lower case with initial capitals only as shown. Letter- and word-spacing to follow Corps standards as specified in Appendix D.




| Sign Type | Legend Size (A) | Panel Size | Post Size | Specification Code | Mounting Height | Color Bkg/Lgd |
|---|---|---|---|---|---|---|
| CID-02 | various | 4'x4' | 4"x4" | HDO-3 | 48" | WH/BK-SG |



**EP 310-1-6a**
**01 Jun 06**

## Fabrication and Mounting Guidelines

All Construction Project Identification signs and Safety Performance signs are to be fabricated and installed as described below. The signs are to be erected at a location designated by the contracting officer representative and shall conform to the size, format, and typographic standards shown on pages16-2 and 16-3. Detailed specifications for HDO plywood panel preparation are provided in Appendix B.

Shown below the mounting diagram is a panel layout grid with spaces provided for project information. Photocopy this page and use as a worksheet when preparing sign legend orders.

For additional information on the proper method to prepare sign panel graphics, contact the district Sign Program Manager.

The sign panels are to be fabricated from .75" High Density Overlay Plywood. Panel preparation to follow HDO specifications provided in Appendix B.

Sign graphics to be prepared on a white nonreflective vinyl film with positionable adhesive backing.

All graphics except for the Communication Red background with Corps Signature on the project sign are to be die-cut or computer-cut nonreflective vinyl, prespaced legends prepared in the sizes and typefaces specified and applied to the background panel following the graphic formats shown on pages 16-2 and 16-3.

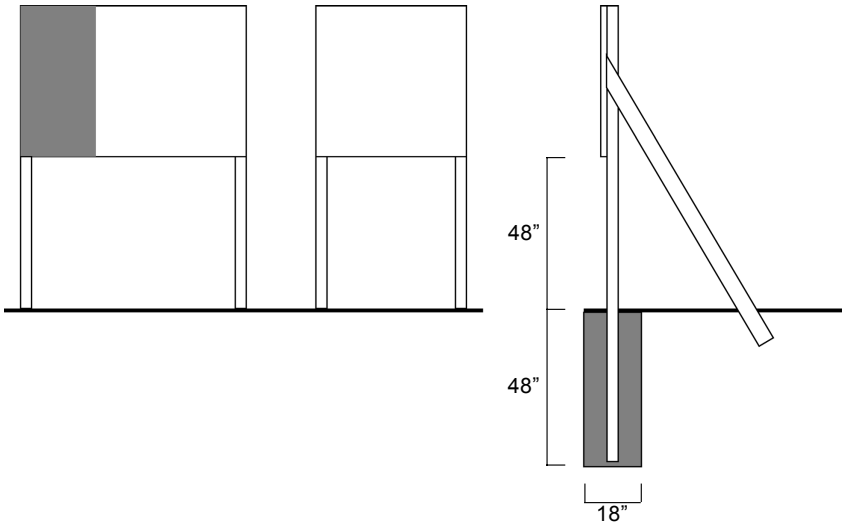
The 2'x 4' Communication Red panel (to match Pantone system 032) with full Corps Signature (reverse version) is to be screen-printed on the white background. Identification of the district or division may be applied under the signature with white cut vinyl letters prepared to Corps standards.

Drill and insert six (6) .375" T-nuts from the front face of the HDO sign panel. Position holes as shown. Flange of T-nut to be flush with sign face.

Apply graphic panel to prepared HDO plywood panel following manufacturers' instructions.

Sign uprights to be structural grade 4" x 4" treated Douglas Fir or Southern Yellow Pine, No.1 or better. Post to be 12' long. Drill six (6) .375" mounting holes in uprights to align with T-nuts in sign panel. Countersink (.5") back of hole to accept socket head cap screw (4" x .375").

Assemble sign panel and uprights. Imbed assembled sign panel and uprights in 4' hole. Local soil conditions and/or wind loading may require bolting additional 2" x 4" struts on inside face of uprights to reinforce installation as shown.




Construction Project Identification Sign
Legend Group 1: Corps Relationship

1. _____
2. _____

Legend Group 2: Division/District Name

1. _____
2. _____

Legend Group 2a: Military/Civil Works Sponsor

1. _____
2. _____

Legend Group 3: Project Title

1. _____
2. _____
3. _____

Legend Group 4: Facility Name

1. _____
2. _____

Legend Group 5: Contractor/A&E

1. _____
2. _____
3. _____
4. _____
5. _____

Legend Group 5b: Contractor/A&E

1. _____
2. _____
3. _____
4. _____
5. _____

Safety Performance Sign
Legend Group 2: Project Title

1. _____
2. _____

Legend Group 3: Contractor/A&E

1. _____
2. _____

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TEMPORARY ENVIRONMENTAL CONTROLS - AIR FORCE INSTALLATIONS
**10/14/22**

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

| | |
|---|---|
| ISO 14001 | (2015) Environmental Management Systems - Requirements with Guidance for Use |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| JEGS | (April 2024) Japan Environmental Governing Standards |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910 | Occupational Safety and Health Standards |

## 1.2 DEFINITIONS

In some cases, definitions are given only for illustrative purposes. Prevailing JEGS definitions shall be used for environmental compliance requirements.

### 1.2.1 Aboveground Storage Tank

A portable or fixed POL aboveground storage container as defined in the JEGS with a capacity greater than 55 gallons. A container with a capacity greater than 55 gallons which is a fixed installation or is portable and is either an aboveground storage container as defined in the JEGS or a below ground storage container as defined in the JEGS which contains POL, hazardous materials, hazardous substances or hazardous waste.

### 1.2.2 Asbestos Containing Material (ACM)

Any material containing greater than or equal to one-tenth of one percent (0.1 percent) asbestos, by weight.

### 1.2.3 Bulky Waste

Large items of solid waste such as household appliances, furniture, large auto parts, trees, branches, stumps, and other oversize wastes whose large size precludes or complicates their handling by normal solid waste collection, processing, or disposal methods.

1.2.4 Chemical Wastes

Salts, acids, alkalis, herbicides, pesticides, organic chemicals, and spent products, which serve no purpose.

1.2.5 Class I and II Ozone Depleting Substance (ODS)

Class I and II ODS are listed in the JEGS.

1.2.6 Construction and Demolition Waste

The waste building materials, packaging, and rubble resulting from construction, remodeling, repair and demolition operations on pavements, houses, commercial buildings, and other structures.

1.2.7 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.8 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.9 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.10 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.11 Food Waste

Organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods (commonly called garbage).

1.2.12 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with the JEGS. Hazardous debris also includes

debris that exhibits a characteristic of hazardous waste in accordance with the JEGS.

1.2.13 Hazardous Materials

Hazardous material is any material that is capable of posing an unreasonable risk to health, safety, or the environment if improperly handled, stored, issued, transported, labeled, or disposed because it displays a characteristic listed in the JEGS. Munitions are excluded.

1.2.14 Hazardous Substances

Any substance having the potential to do serious harm to human health or the environment if spilled or released in reportable quantity. A list of these substances and the corresponding reportable quantities is contained in the JEGS.

1.2.15 Hazardous Waste

Hazardous Waste is discarded material that may be solid, semi-solid, liquid, or contained gas, and either exhibits a characteristic of a hazardous waste as defined in the JEGS. Excluded from this definition are domestic sewage sludge, household wastes, and medical wastes.

1.2.16 Installation Pest Management Consultant

Installation Pest Management Consultant (IPMC) is the professional DoD pest management personnel located at component headquarters, field operating agencies, major commands, facilities engineering field divisions or activities, or area support activities who provide technical and management guidance for the conduct of installation pest management operations. Some pest management consultants may be designated by their component as certifying officials.

1.2.17 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, or discharge into defined drainage areas (includes drainage ditches, streams, rivers, ocean, etc.) must occur. Comply with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements.

1.2.18 Lead-Based Paint (LBP)

Paint or other surface coatings that contain greater than or equal to 1.0 milligram per square centimeter (cm), or 0.5 percent by weight, or 5,000 ppm of lead by weight.

1.2.19 Oily Wastes

Oily wastes are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from those POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludge, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.20 Pesticide

Pesticide is any substance or mixture of substances, including biological control agents that may prevent, destroy, repel, or mitigate pests.

1.2.21 Pesticide Treatment Plan

A plan for the prevention, monitoring, and control to eliminate pest infestation.

1.2.22 Pests

Anthropods, birds, rodents, nematodes, fungi, bacteria, viruses, algae, snails, marine borers, snakes, weeds, undesirable vegetation, and other organisms (except for microorganisms that cause human or animal disease) that adversely affect the well-being of humans or animals; attack real property, supplies, equipment, or vegetation; or are otherwise undesirable.

1.2.23 Petroleum, Oil, and Lubricants

Refined petroleum, oils, and lubricants, including, but not limited to, petroleum, fuel, lubricant oils, synthetic oils, mineral oils, animal fats, vegetable oil, sludge, and POL mixed with wastes other than dredged spoil.

1.2.24 Polychlorinated Biphenyl (PCB)

Any PCB article, PCB article container, PCB container, or PCB equipment that deliberately or unintentionally contains or has as a part of it any detectable concentration of PCB.

1.2.25 Regulated Waste

Regulated waste are solid wastes that have specific additional JEGS, Federal, or GOJ national and prefectural controls for handling, storage, or disposal.

1.2.26 Rubbish

A general term for solid waste, excluding food wastes and ashes, taken from residences, commercial establishments, and institutions.

1.2.27 Sanitary Waste

a. Sewage: Wastes characterized as domestic sanitary sewage.

b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2.28 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.29 Solid Waste

Solid waste is garbage, refuse, sludge, and other discarded materials, including solid, semi-solid, liquid, and contained gaseous materials resulting from industrial and commercial operations and from community activities. It does not include solids or dissolved material in domestic sewage or their significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation return flows, or other common water pollutants.

Types of solid waste typically generated at construction sites may include:

1.2.29.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 60 mm particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.29.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.29.3 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, characteristic of a hazardous waste as defined in the JEGS or is listed as a hazardous waste in the JEGS. Excluded from this definition is medical wastes.

1.2.29.4 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade

paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company.

1.2.29.5 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.29.6 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.30 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, or creeks, or waters of Japan. Surface discharges are discrete, identifiable sources and require a permit from the governing agency. Comply with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements.

1.2.31 Wastewater

Wastewater is the used water and solids from a community that flow to a treatment plant.

1.2.31.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.32 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.3 PROHIBITED PRODUCTS

The following items are forbidden for use by the JEGS or other criteria. Details of each are included in the text of each chapter of the Environmental Protection Plan (EPP) described in this section.

a. Asbestos Containing Materials (ACM).

b. Lead-Containing Paint. Paint containing greater than 0.009 percent lead by weight.

c. Polychlorinated Biphenyls (PCBs). Materials containing PCBs greater

than 0.5mg/kg shall not be used.

d. Class I Ozone Depleting Substances (ODS). Class 1 ODS listed in the JEGS shall not be used.

e. Lead-containing Drinking-Water Pipes, Solders, Flux, and Fittings. Comply with JEGS requirements where applicable.

f. Equipment containing radioactive materials (eg. XRF analyzer, soil compaction/density tester etc.) will require prior coordination and approval from SGXB.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey

Regulatory Notifications; G

Environmental Protection Plan; G

Environmental Manager Qualifications; G

Licenses/Permits/Notifications; G

Written Assessment Of Friable Asbestos Disturbance

SD-06 Test Reports

Laboratory Analysis

Nonhazardous Solid Waste Diversion Report

SD-07 Certificates

Asbestos Certification; G

Lead Certification; G

SD-11 Closeout Submittals

Environmental Records Binder

## 1.5 PAYMENT

No separate payment shall be made for work covered under this section. Payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor, and payment of all fines/fees for violation or non-compliance with GOJ, Federal, and local laws and regulations are the Contractor's responsibility. All costs associated with this section shall be included in the Contract price.

## 1.6 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the Contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements pertaining to the environment, including but not limited to water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Laboratory analyses necessary to implement the JEGS shall be conducted in a laboratory certified by a U.S. or GOJ regulatory authority for the applicable test method. In the absence of a certified laboratory, contact the Contracting Officer for further guidance.

Contractor shall be responsible to ensure that subcontractors comply with all environmental protection requirements of this section.

The Contractor shall record any problems in complying with laws, regulations, permit requirements, ordinances, and corrective actions taken. The Contractor shall immediately inform the Contracting Officer of any environmental problems.

### 1.6.1 Conformance with the Environmental Management System

Perform work under this Contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the Contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

## 1.7 SPECIAL ENVIRONMENTAL REQUIREMENTS

### 1.7.1 Asbestos Prohibition and Certification

a. Materials or products containing more than one-tenth of one percent (0.1 percent) by total weight, of the material or product, of asbestos shall not be used in this project. The Contracting Officer, at any time prior to acceptance of the work, or during the period designated for warranty of the work, if any, may reject materials and products that contain asbestos in excess of one-tenth of one percent by weight, and direct the removal of such materials and products from the job site, at the sole expense of the Contractor, and without additional time granted for performance of the work. After completion of this Contract, if asbestos (exceeding 0.1 percent by weight) is discovered in the products or materials (excluding items permitted by the exception) installed by the Contractor, the Government reserves the right to direct the Contractor to perform asbestos abatement and restoration work, as required, at the Contractor's sole cost. Asbestos abatement work (removal and disposal of asbestos-containing materials and products) shall be accomplished in accordance with currently applicable Government standards for such work.

   Exception: Where suitable asbestos-free substitutes do not exist for a material or product, the Contractor may use a material or product containing asbestos in the excess of 0.1 percent by weight, with prior written approval of the Contracting Officer. Submit a written request for substitution, accompanied by a certification from the manufacturer of the material or product that shall set forth, in specific detail, the amount of asbestos present in the material or product. When available, laboratory analysis of the material or product for asbestos content shall be included with the submittal.

b. The Government may conduct asbestos testing on suspected asbestos-containing materials and products excluding items permitted by the "exception", and such testing shall be conducted at the expense of the Government. However, wherever destructive testing is required, or a material or product must be utilized by the Government for testing, the Contractor shall, at its own expense, repair or replace the material or product, or the item of work that has been disturbed by testing, if the results confirm presence of asbestos exceeding 0.1 percent by weight. In the event test results indicate 0.1 percent or less asbestos content or complete absence of asbestos, the Contractor shall restore the test site to its original condition and the cost of restoration work, as approved by the Contracting Officer, shall be borne by the Government.

c. As a minimum, furnish manufacturer's certification for the items listed below, excluding items permitted by the "exception", certifying that the items are asbestos-free or do not contain asbestos in excess of 0.1 percent by weight, as applicable. However, when presence of asbestos is suspected in other products and materials used in this project, the Contractor shall be required to provide such certification for those additional items when so directed by the Contracting Officer. Asbestos certification shall be required for the items applicable to this project only.

   (1) Vinyl sheet/vinyl tile flooring, including accessories and adhesives.

(2) Insulation materials, including facing.

(3) Gaskets for piping and duct work.

(4) Acoustical tiles.

(5) Firestopping materials.

(6) Fireproofing materials.

(7) Special coating, including factory applied coatings, on sheet metal roofing and siding.

(8) Wallboard for all interior and exterior applications, including joint compounds.

(9) Adhesives (other than item 1) used in the project.

(10) Tape materials used in the project.

(11) Roofing and siding, nonmetallic.

(12) Felt materials and cushion materials.

(13) Pre-mixed mortars, grouts, leveling compounds, fillers, and other cementitious materials.

(14) Caulking and sealing materials.

d. All submittals shall be accompanied by a certification from the manufacturer of the material or product that the material or product is asbestos-free; or shall set forth, in specific detail, the amount of asbestos present in the material or product. Documentary evidence of laboratory analysis of the material or product for asbestos content, conducted by a qualified independent testing laboratory, shall be included with the submittal.

1.7.2 Lead Prohibition and Certification

a. Paint or product coating containing more than 0.009 percent) by total weight of lead shall not be used in this project. The Contracting Officer, at any time prior to acceptance of the work, or during the period designated for warranty of the work, if any, may reject materials and products that contain lead in excess of 0.009 percent by weight, and direct the removal of such materials and products from the job site, at the sole expense of the Contractor, and without additional time granted for performance of the work. After completion of this Contract, if lead (exceeding 0.009 percent by weight) is discovered in the products or materials (excluding items permitted by the exception) installed by the Contractor, the Government reserves the right to direct the Contractor to perform lead abatement and restoration work, as required, at the Contractor's sole cost. Lead abatement work (removal and disposal of lead-containing materials and products) shall be accomplished in accordance with currently applicable Government standards for such work.

Exception: Where suitable lead-free substitutes do not exist for a paint or product coating, the Contractor may use a material or product containing lead in the excess of 0.009 percent by weight, with

prior written approval of the Contracting Officer. Submit a written request for substitution, accompanied by a certification from the manufacturer of the material or product that shall set forth, in specific detail, the amount of lead present in the material or product. When available, laboratory analysis of the material or product for lead content shall be included with the submittal.

b. The Government may conduct lead testing on suspected lead-containing materials and products excluding items permitted by the "exception", and such testing shall be conducted at the expense of the Government. However, wherever destructive testing is required, or a material or product must be utilized by the Government for testing, the Contractor shall, at its own expense, repair or replace the material or product, or the item of work that has been disturbed by testing, if the results confirm presence of lead exceeding 0.009 percent by weight. In the event test results indicate 0.009 percent or less lead content or complete absence of lead, the Contractor shall restore the test site to its original condition and the cost of restoration work, as approved by the Contracting Officer, shall be borne by the Government.

c. As a minimum, furnish manufacturer's certification for the items listed below, excluding items permitted by the "exception", certifying that the items are lead-free and do not contain lead in excess of 0.009 percent by weight, as applicable. However, when presence of lead is suspected in other products and materials used in this project, the Contractor shall be required to provide such certification for those additional items when so directed by the Contracting Officer. Lead certification shall be required for the items applicable to this project only.

1. Paints and Coatings

2. Any product or material with a factory applied coating

1.7.3 Class I and Class II Ozone Depleting Chemicals (ODC) or Substances (ODS)

Class I and II Ozone Depleting Substances listed in the JEGS are prohibited from being used. Contactor must provide certifications that materials utilized do not contain Class I and Class II ODC/ODS.

1.7.4 Polychlorinated Biphenyls (PCB)

Materials (ballasts, capacitors, transformers, dielectric fluid, switches, etc.) that contain PCBs are prohibited. Contractor must provide certifications that materials utilized do not contain PCBs, in accordance with the JEGS.

1.7.5 Hazardous Material Survey

The Contractor shall review the Inspection Report For Asbestos, Lead-Based Paint, Chromium, Cadmium, PCBs, And Miscellaneous Hazardous Materials by EnviroQuest, Inc. dated June 2023, attached at the end of this section, to familiarize themselves with the materials that have been sampled and tested for this project. The Contractor shall utilize the information contained within the report to develop their work and compliance plans with regards to Hazardous Materials. During construction, should potentially hazardous material be discovered, which has not been

previously tested, the Contractor shall take action to assure that the untested material is not disturbed and contact the Contracting Officer.

## 1.8 QUALITY ASSURANCE

### 1.8.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

### 1.8.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with GOJ national and prefectural laws and regulations and installation requirements. Submit copies of regulatory notifications to the Contracting Officer at least 20 days prior to commencement of work activities.

### 1.8.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the installation; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to discuss the proposed Environmental Protection Plan (EPP). Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

Permits, licenses, or other forms of official approvals are not required by DoD activities and installations. Permits, licenses, or other forms of official approvals may, however, be required under GOJ law for certain contracted activities. When required, all such permits, licenses and other forms of official approval shall be obtained by the Contractor from the appropriate GOJ authorities. DoD Components shall assist Contractors when they are applying for a required permit, license or other form of official approval by providing necessary information only. Submit copies of all Licenses/Permits/Notifications obtained.

### 1.8.4 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager is directly responsible for coordinating Contractor compliance with the JEGS, Federal, GOJ national and prefectural laws and regulations, and installation requirements. The Environmental Manager must ensure compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the EPP; ensure environmental permits are obtained, maintained, and closed out; ensure compliance with Stormwater Program requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers). This can be a collateral position; however, the person in this position must be trained to adequately accomplish the following duties: ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure Contractor personnel are trained in JEGS requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out. Submit Environmental Manager Qualifications to the Contracting Officer to indicate the training and past experience which meets the requirements of this position as described in this section.

### 1.8.5 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the Contract meeting applicable JEGS requirements. Provide Employee Training Records in the Environmental Records Binder. Ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with the JEGS and all applicable Federal, GOJ national or prefectural laws or regulations and installation requirements. Submit these Assembled Employee Training Records in the Environmental Records Binder to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet the JEGS and all applicable Federal, GOJ national or prefectural laws or regulations, and Installation requirements. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, waters of Japan, and endangered species and their habitat that are known to be in the area.

### 1.8.6 Non-Compliance Notifications

The Contracting Officer shall notify the Contractor in writing of any observed noncompliance with the JEGS, applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such

action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the Contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

## 1.9 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after Notice to Proceed (NTP). Commencement of work will not begin until the Environmental Protection Plan has been approved.

Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or Contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any JEGS, and applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version of the EPP onsite.

### 1.9.1 Submission Guidance

The EPP is a required submittal for all projects, and shall be submitted a minimum of 14 days prior to the scheduled start of construction activities or delivery of materials to the site. Work impacted by the contents of the EPP cannot start prior to approval of the EPP. Maintain a copy of the approved EPP on-site at all times.

If disapproved, the Contractor shall revise and resubmit the EPP to properly address reviewer comments. Delays resulting from disapproval are the responsibility of the Contractor.

### 1.9.2 EPP Drafting Instructions

Address the topic of each chapter at a level of detail commensurate with the environmental issue and the scope of work. The EPP shall explain how the Contractor will meet the requirements in each chapter. Chapters that are not applicable to this project shall be replaced with the following:

"This chapter does not apply to the Contract because" followed by a brief explanation on why it does not apply.

The EPP shall not be merely a reiteration of the requirements or the text of instructions in this section, except for the "Not Applicable" chapters. The EPP shall explain how the Contractor will meet the requirements in each chapter.

Any site-specific environmental issues identified as necessary by the Government shall be addressed in the EPP even if this supplement does not specifically mention such a situation as a requirement.

1.9.3 EPP General Overview and Purpose

1.9.3.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, solid waste management plan, wastewater management plan, air pollution control plan, contaminant prevention plan, a historical, archaeological, cultural resources, biological resources and wetlands plan, traffic control plan, Hazardous, Toxic and Radioactive Waste (HTRW) Plan, Non-Hazardous Solid Waste Disposal Plan, and borrowing material plan.

Include a list of applicable Federal, GOJ, JEGS, prefectural laws, regulations, and permits concerning environmental protection, pollution control, and abatement that are applicable to the Contractor's proposed operations and requirements imposed by those laws, regulations, and permits. Whenever there is conflict between Federal, GOJ, JEGS, or prefectural laws, regulations, and permit requirements, the strictest applicable rule applies.

1.9.3.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

Provide the name, telephone number, and address of a Primary and Alternate Environmental Representative.

1.9.3.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

Provide schedule of digging or trenching actions to include date/time, location, purpose, method and depth.

1.9.3.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.9.3.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.9.4 General Site Information

1.9.4.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.9.4.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.9.4.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.9.4.4 Regulatory Notification and Permits

List the required notifications and permit applications. Some permits require up to 180 days to obtain. Demonstrate that permits have been obtained or applied for by including hard copies. The EPP shall not be approved until the permits have been obtained.

1.9.5 CHAPTER 1: ENVIRONMENTAL REQUIREMENTS AND TRAINING

1.9.5.1 Criteria Summary

Provide and maintain environmental protective measures to control pollution that develops during normal construction practice during the life of the Contract.

1.9.5.2 Applicable Regulations

Comply with all laws and regulations referenced in the drawings and specifications, as well as applicable GOJ and prefectural laws or regulations, referenced or not.

1.9.5.3 EPP Mandatory Items

Include the following items in the EPP:

a. Environmental Manager Appointment Letter: Include a letter signed by an officer of the firm designating a Primary and an Alternate Environmental Manager with telephone number (office phone number, cell phone number), e-mail address, and mailing address and stating that this person is responsible for managing and implementing the Environmental Program as described in this Contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work. The Environmental Manager shall

be responsible for providing all project Environmental submittals and for coordinating with the Contracting Officer on any environmental issues encountered during work.

b. Employee Training Letter: The Environmental Manager shall implement a training program to ensure that all Contractor personnel are trained in environmental protection requirements. Include a letter that lists employee's names, types of environmental training completed, and dates of completion.

1.9.6 CHAPTER 2: AIR EMISSIONS AND OZONE DEPLETING SUBSTANCES (ODS)

1.9.6.1 Criteria Summary

ODSs, including Hydrofluorocarbons (HFC) and perfluorocarbons (PFC) from refrigeration and fire suppression equipment, are categorized into two specific classes. See the JEGS for proper classifications.

1.9.6.2 EPP Mandatory Items

Include the following items in the EPP as applicable:

a. Haul Route: Submit truck and material haul routes along with a Dirt and Dust Control Plan in the EPP for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

b. Pollution Generating Equipment: Identify air pollution generating equipment or processes that may require compliance with the JEGS or GOJ national or prefectural laws-regulations. Determine requirements based on any current JEGS and installation requirements and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager).

c. Stationary Internal Combustion Engines: Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between emergency and non-emergency operation.

d. Refrigerants: Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with the JEGS and installation requirements. Technicians shall be trained in proper recovery/recycling procedures, leak detection, safety, shipping, and disposal in accordance with recognized industry standards or Japanese equivalent. Any refrigerant reclaimed is the property of the Government; coordinate with the Installation Environmental Office to determine the appropriate turn in location.

e. Training/Certification Requirements: Heating and air conditioning

technicians must be trained to meet requirements in the JEGS. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by GOJ national or prefectural laws and regulations. Submit training certificates as part of the EPP.

f. Air Pollution-Engineering Processes: Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

g. Compliance Materials: Provide the Government a list of and SDSs for all hazardous materials proposed for use on site. Materials must be compliant with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Government may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.9.6.3 Other Required Submittals

For Contracts servicing, removing, or replacing ODS-containing items, such as refrigeration or fire suppression equipment, follow the guidance for submittals in accordance with the specifications under which the work is being performed (HVAC, Fire Suppression, etc.).

1.9.7 CHAPTER 3: WATER RESOURCES

1.9.7.1 EPP Mandatory Items

Include the following items in the EPP as applicable:

a. Site-Specific Storm Water Pollution Prevention Plan (SWPPP): For any Contract where work may possibly lead to disruption of the stormwater flow, the Contractor shall develop and submit a project-specific SWPPP as a mandatory part of Chapter 3 of the EPP.

The SWPPP must include effective selection, implementation and maintenance of Best Management Practices (BMPs) as indicated in the JEGS, and include methods and drawings as necessary to prevent storm water pollution as specified in the Storm Water Pollution Prevention Measures section in Part 3. The SWPPP shall also address erosion and sediment control measures and stormwater management and control including, but not limited to ground cover, erodible soils, temporary measures - structural practices, temporary and permanent stabilization. The SWPPP must meet the requirements of the JEGS and the Installation's SWPPP.

If applicable, submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Contracting Officer for approval, prior to the commencement of work. The Contractor shall maintain an approved copy of the SWPPP at the construction on-site office, and continually update as regulations require, to reflect current site conditions. The Contractor may be required to install, inspect, maintain best management practices (BMPs), and submit storm water BMPs

inspection reports and storm water pollution prevention plan inspection reports.

The SWPPP must meet the requirements of the JEGS and the Installation's SWPPP.

Include the following:

a. Identify potential sources of pollution which may be reasonably expected to affect the quality of storm water discharge from the site.

b. Comply with terms of the Installation SWPPP for stormwater discharges from construction activities. Prepare SWPPP in accordance with the JEGS and installation requirements.

c. Select applicable BMPs from the JEGS and/or the Installation SWPPP. Applicable Best Management Practices in the JEGS shall be incorporated into the site-specific SWPPP and implemented.

d. The SWPPP shall also address erosion and sediment control measures and stormwater management and control including, but not limited to ground cover, erodible soils, temporary measures - structural practices, temporary and permanent stabilization.

b. Wastewater Management Plan (WWMP): For any Contract that may generate wastewater, the Contractor shall submit a WWMP.

(1) The WWMP must identify the methods and procedures for management and/or discharge of wastewater which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

(2) If a settling/retention pond is required, the WWMP must include the design of the pond, including drawings, removal plan, and testing requirements for possible pollutants. If disposal is to a sanitary sewer, the WWMP must include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

(3) Contractor is not authorized sewage holding tanks on base and is not authorized to dispose of waste from chemical toilets/porta-potties via the installation sewer system.

(4) When using chemical toilets, plan for procuring a porta-potty/chemical toilet service Contract. The porta-potty/chemical toilet service Contract must include the correct maintenance, waste collection, transportation, and disposal of all porta-potty/chemical toilets and content and include provisions for pest control and elimination of odors.

(5) If the project generates wastewater from rinsing tanks, dewatering sites, etc., the Contractor shall ensure proper disposal with CEIE approval. The Contractor may be required to provide further analysis and treatment based on the condition of wastewater.

### 1.9.8 CHAPTER 4: HAZARDOUS MATERIALS

#### 1.9.8.1 Criteria Summary

Hazardous Material Inventory, Material Safety Data Sheets, and Safety Data Sheets: Submit documentation and receive approval prior to bringing any hazardous materials (HAZMAT) onto the installation. Consult with the Hazardous Materials Program Manager 718 CES/CEIE at DSN 634-2600 for a determination of whether or not a product is a HAZMAT. Equipment containing radioactive materials (eg. XRF analyzer, soil compaction/density tester etc.) will require prior coordination and approval from SGXB.

#### 1.9.8.2 EPP Mandatory Items

For all Contracts where HAZMAT will be brought to the worksite, submit the following documents in Chapter 4 of the EPP:

a. Hazardous Material Inventory: A table listing all hazardous materials brought onto the base, including the estimated amounts of each material that will be used. List shall include all pesticides and herbicides that will be brought onto the Installation.

b. Hazmat SDS: An SDS sheet for each hazardous material on the inventory.

#### 1.9.8.3 Other Required Submittals

If after beginning work, the Contractor discovers previously undisclosed, unexpected, or suspected HAZMAT, substances, chemicals, or contaminated areas, the Contractor shall immediately report the discovery to the Contracting Officer and to 718 CES/CEIE (DSN 634-2600). Contractor personnel shall immediately cease work in the area, unless the work is of an emergency nature and the risk of exposure can be mitigated by the use of personal protective equipment (PPE) or clothing. Submit, in writing, a Notification of Unexpected Hazardous Material Discovery to the Contracting Officer outlining the events leading to the discovery.

### 1.9.9 CHAPTER 5: HAZARDOUS WASTE

#### 1.9.9.1 EPP Mandatory Items

For all Contracts where Hazardous Waste will be generated, submit the following information and documents in Chapter 5 of the EPP:

a. Hazardous Waste Manager Letter: A letter designating the hazardous waste manager. The letter shall include:

(1) Manager's name.

(2) Training and experience.

(3) Contact information.

b. Management Procedures for Hazardous Waste to be Generated: The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan (HWMP). The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan. As a minimum, include the following:

(1) List of the types of hazardous wastes expected to be generated.

(2) Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated.

(3) Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications. Follow the analytical procedure and methods in accordance with the JEGS and all applicable GOJ national or prefectural laws and regulations. Identify hazardous waste by analyzing for the following characteristics: ignitability, corrosivity, reactivity, and toxicity based on TCLP results. Provide analytical results and reports performed to the Contracting Officer. Sample waste in accordance with appropriate Japanese or U.S. EPA testing protocols that meet the purpose of the testing. Clearly mark each sampled drum or container with the Contractor's identification number, and cross reference to the chemical analysis performed.

(4) Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers).

(5) Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted).

(6) Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions, applicable Federal, GOJ and prefectural laws and regulations, JEGS, and Installation Hazardous Waste Management Plan.

(7) Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar.

(8) Used oil management procedures in accordance with the JEGS; Hazardous waste minimization procedures. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

(9) Plans for the disposal of hazardous waste by permitted facilities; and procedures to be employed to ensure required employee training records are maintained.

(10)Procedures to be employed to ensure required employee training records are maintained.

(11) Hazardous Waste Disposal local permits or licenses for hazardous waste disposal in accordance with the JEGS (if required).

(12) Hazardous Waste Disposal Statement of Agreement. From a treatment, storage, or disposal (TSD) facility that will accept the waste from the contractor and also a statement from a certified hazardous waste transporter who will transport the waste to the TSD facility in accordance with the JEGS (if required).

1.9.9.2 Other Required Submittals

a. Hazardous Waste Analysis Report: For any materials that were sampled and analyzed for hazardous waste content, submit a Hazardous Waste Analysis Report containing:

(1) Who the sample was taken by.

(2) What type of sample was taken (soil, water, chemical, etc.).

(3) Where the sample was taken (building number, room number, etc.).

(4) The sampling time and date.

(5) An explanation of why the material was sampled (disposal determination, final clearance, etc.).

(6) Photographs of the sampled location or material (if required to positively identify the exact location or material later).

(7) The laboratory's certified analysis results letter.

1.9.10 CHAPTER 6: SOLID WASTE

1.9.10.1 EPP Mandatory Items

Solid Waste Management Plan: To ensure the Contractor understands the solid waste reduction requirements, the Contractor is required to submit a Solid Waste Management Plan SWMP, as part of the EPP. The Solid Waste Management Plan shall be consistent with the Installation Integrated Solid Waste Management Plan (ISWMP).

The SWMP has four (4) sections: Diversion, Procedures, Training, and Permits.

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or Solid Waste Management License showing such agency's approval of the disposal plan before transporting wastes off Government property.

a. SWMP: Diversion Section

Provide the dates for the start and end of work, the types of wastes expected to be generated by the project, estimated weights for each type of waste, and the facility or facilities where each waste will be taken. Also include a list of which wastes will be salvaged, reused, and recycled, estimated weights for each recyclable commodity, and the facility or facilities where each recyclable will be taken.

To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill. Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local

permit (cover) or license for recycling.

b. SWMP: Procedures Section: Describe the planned Separation, Contamination Prevention, and Transportation procedures.

(1) Outline how recyclables will be separated from other wastes, how wastes will be collected, and where they will be stored at the project site until transported to recycling facilities. The Separation Procedures shall also detail how other wastes will be collected and where they will be stored at the project site until transported to disposal facilities. Containers for recyclables and other wastes must meet the requirements in the JEGS that storage of recyclables and other wastes must meet the JEGS and that storage of bulky wastes must meet the JEGS.

(2) Contamination Prevention Procedures shall explain how recyclables will be kept free from contaminants (hazardous, toxic, or other wastes) and how other non-recyclable wastes will be kept free of contaminants (recyclables and hazardous or toxic wastes).

(3) Transportation Procedures shall outline how spills of recyclables or other wastes will be prevented during collection, storage, loading, and transportation. They also detail how the recyclables and other wastes will be transported from the project site to the recycling or disposal facility. These procedures also must state how often recyclables and other wastes will be picked up by the transportation company.

c. SWMP: Training Section

Set forth how employees and subcontractors will be trained on solid waste management policies and procedures. Include how training will be documented and who will conduct the training. Also outline any consequences or repercussions for employees or subcontractors that fail to follow the policies and procedures.

d. SWMP: Permits Section

Include copies of all permits, licenses, and agreements for the recycling and disposal facilities and for the transportation companies utilized during the project. Include English translations for all documents in this section.

1.9.10.2 Other Required Submittals

a. Solid Waste Management Report: During project execution, the Contractor shall submit weight tickets or manifests, receipts, bills of sale, and other sales documentation (with English translations) for all materials removed from the project site. Weight tickets and manifests receipts, bills of sale, and other sales documentation shall be submitted during the project every month by the 5th day of the following month, (include this statement as part of the SWMP). Designate on each document whether the material was disposed of, recycled, or reused, and state the amounts, locations, and names of the businesses receiving the solid waste.

In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. Also include

any additional or renewal permits, licenses, or agreements, with recycling or disposal landfills.

1.9.11 CHAPTER 7: FUEL STORAGE TANKS

1.9.11.1 EPP Mandatory Item

1.9.12 CHAPTER 8: HISTORICAL, CULTURAL, AND NATURAL RESOURCES

1.9.12.1 EPP Mandatory Items

a. Description of measures to manage and mitigate damage to natural resources including, but not limited to land resources, tree protection, replacement of damaged landscape features, temporary construction, stream crossings, fish and wildlife resources, and wetlands areas.

b. Objectives and methods to protect identified historical and archeological resources.

1.9.12.2 Other Required Submittals

Notification Of Discovery Or Historical Or Cultural Items: The Contractor shall immediately report the discovery of any historical and/or archaeological items or human remains in the course of work to the Contracting Officer and the Kadena Air Base Environmental Office at DSN 634-2600.

Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities.

Stop work immediately in the area of the discovery until the Environmental Office evaluates the site. The Contracting Officer will provide direction on how to proceed. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

The Contractor shall be responsible for completing and submitting official paperwork on the discovery. The Environmental Office's Cultural Resources Manager will advise the Contractor concerning the content of the report.

1.9.13 CHAPTER 9: POLYCHLORINATED BIPHENYLS (PCB)

1.9.13.1 EPP Mandatory Items

Information on the PCB equipment that will be removed, including, but not limited to:

(a) Equipment type.

(b) Month/year of manufacture.

(c) Date removed from service.

(d) Building number, circuit number or set number.

(e) Base from which item was removed.

Items (c) - (e) shall also be written on the equipment chassis in permanent ink.

1.9.14 CHAPTER 10: PESTICIDES

1.9.14.1 EPP Mandatory Items

1.9.15 CHAPTER 11: ASBESTOS CONTAINING MATERIALS (ACM)

1.9.15.1 EPP Mandatory Items

Indicate whether the project involves sampling, disturbance, and/or abatement of any ACM. Refer to section 02 82 00 for asbestos management and disposal requirements.

Insert the following text in Chapter 11 of the EPP:

"CHAPTER 11: ASBESTOS-CONTAINING MATERIALS (ACM)

1. An Asbestos Hazard Abatement and Disposal Plan will be submitted separately in accordance with the ACM specifications and supplements. The Contractor understands that the plan must be approved prior to beginning site work."

1.9.15.2 Other Mandatory Requirements

If ACM is unexpectedly discovered at the worksite, submit an Unexpected Discovery of Asbestos Report to the Contracting Officer, briefly explaining the location of discovery, the time and date.

Consult with the Environmental Representative in advance of drafting the EPP if asbestos applicability is uncertain.

1.9.16 CHAPTER 12: LEAD-BASED PAINT (LBP)

1.9.16.1 EPP Mandatory Items
Indicate whether the project involves sampling, disturbance, removal, and/or abatement of lead-containing and/or LBP. Refer to section 02 83 00 LEAD REMEDIATION for lead paint management and disposal requirements.

Consult with the Environmental Representative in advance of drafting the EPP if lead applicability is uncertain.

1.9.17 CHAPTER 13: SPILL PREVENTION AND RESPONSE

1.9.17.1 EPP Mandatory Items

1.9.17.2 Other Mandatory Requirements

Prevention: Procedures to prevent releases to the environment.

Spill Notification: The Contractor is required to submit a written Spill Notification when a worksite spill occurs. The quantity of POL spilled determines the amount of information required on the report and the deadline for submission. Consult with Kadena Air Base Environmental

Section on the requirements when initially reporting the spill.

1.9.18 CHAPTER 14: ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

1.9.18.1 Criteria Summary

In accordance with EO 13693, Kadena Air Base has implemented the ISO 14001 to recognize environmental impacts, reduce our environmental footprint, and to always look to improve the way business is conducted at Kadena Air Base.

1.10 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Maintain digital copies of records to submit. Make separate parts within the binder that correspond to each submittal listed below:

a) Waste Determination Documentation
b) Disposal Documentation for Hazardous and Regulated Waste
c) Stormwater Inspection Reports and Stormwater Pollution Prevention Plan Compliance Notebook

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

The Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out. The Contractor shall provide and install protection for these resources and be responsible for their preservation during the life of the Contract. Environmental protection shall be conducted as follows:

a. Except in areas indicated on the drawing or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources, including trees, shrubs, vines, grasses, topsoil, and land forms without the Contracting Officer's permission. Any anticipated vegetation disturbance needs to be coordinated with the Government before it occurs.

### 3.1.1 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

### 3.1.2 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

### 3.1.3 Banyan Trees

All Banyan trees must be preserved and protected. Banyan trees mark the villages and are used as landmarks for the Okinawans. Any banyan tree requiring destruction or removal must first be coordinated with the 18 CEG/CC, or in his absence with the 18 CEG/CD (for example, trees with 30 percent or more of their root systems destroyed may need to be removed). Protect existing trees from injury, bruising, defacing, or other damage by construction operations.

### 3.1.4 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the JEGS and applicable, Federal, and GOJ national and prefectural laws and regulations, and installation requirements. Construction of stream crossing structures must be in compliance with JEGS, applicable Federal and GOJ national and prefectural laws and regulations, and installation requirements, including the Storm Water Pollution Prevention Plan.

The Contracting Officer's approval and applicable local permits are required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Contracting Officer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Contracting Officer.

### 3.1.5 Endangered Species

At any time an endangered or threatened species, flora or fauna, to include sea turtle nests are encountered, all activities shall stop and the Contracting Officer shall be notified.

### 3.1.6 Indigenous/Native Flora and Fauna

The Contractor shall place emphasis on the protection of habitats

favorable to the reproduction and survival of indigenous flora and fauna. The Contractor shall use indigenous flora for planting/sodding.

### 3.1.7 Invasive Species

Invasive Species are prohibited to be raised, planted, stored or possessed on DoD installations. The Contractor shall not bring in any invasive species to DoD installations.

## 3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water. Storm water management and control shall be detailed in the SWPPP submitted as part of Chapter 3 of the EPP submittal. Refer to paragraph 1.9.9.1.a of this section.

### 3.2.1 Inspection Reports

Submit Inspection Reports and Stormwater Pollution Prevention Plan Compliance Notebook in the Environmental Records Binder and provideto the Contracting Officer in accordance with the JEGS and applicable GOJ or Local Laws and Regulations.

### 3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with GOJ, Federal, and Local prefecture laws and regulations, and JEGS. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

#### 3.2.2.1 Erosion Control

Prevent erosion by mulching, compost blankets, geotextiles, or temporary slope drains. Stabilize slopes by chemical stabilization,sodding,, or a combination of these methods necessary for effective erosion control. Use of hay bales is prohibited.

Any disturbed area with exposed soil that is not being worked on must be seeded or sodded no later than two weeks from the last disturbance regardless of the installation of any other erosion control measures in place. Remove any temporary measures after the area has been stabilized.

#### 3.2.2.2 Sediment Control Practices

Implement sediment control practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement sediment control practices prior to soil disturbance and prior to creating areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Best Management Practices (BMPs) may include, but not limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion

channels, and sedimentation basins.

### 3.2.3 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

### 3.2.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

## 3.3 SURFACE AND GROUNDWATER

### 3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure must be constantly controlled to maintain compliance with existing water quality standards and designated uses of the surface water body. Comply with water quality standards and anti-degradation provisions. Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Installation Environmental Office. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Installation Environmental Officer. Discharge of hazardous substances will not be permitted under any circumstances.

### 3.3.2 Waters of Japan

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of Japan.

### 3.3.3 Water Protection

Contractor shall prevent oily wastes or other hazardous substances from entering the ground, drainage areas, or local bodies of water.

### 3.3.4 Sewage

Contractor is not authorized sewage holding tanks on base and must procure a porta-potty service Contract. The porta-potty Contract must include the correct removal of sewage and maintenance of the facilities.

### 3.3.5 Wastewater

If the project generates wastewater from rinsing tanks, dewatering sites, etc., contact the Contracting Officer on proper disposal.

## 3.4 PROTECTION OF CULTURAL RESOURCES

### 3.4.1 Archaeological Resources

Existing historical, archaeological, and cultural resources within the Contractor's work area will be so designated by the Contracting Officer if any such areas have been identified. If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Installation Cultural Resources Manager via the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

## 3.5 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with the JEGS and all applicable Federal, GOJ national or prefectural air emission and performance laws and regulations.

### 3.5.1 Oil or Dual-fuel Boilers and Furnaces

Provide product data and details for new, replacement, or relocated fuel fired boilers, heaters, or furnaces to the Installation Environmental Office (Air Program Manager) through the Contracting Officer. Data to be reported include: equipment purpose (water heater, building heat, process), manufacturer, model number, serial number, fuel type (oil type, gas type) size (MMBTU heat input). Product data shall be provided prior to equipment installation.

### 3.5.2 Burning

Burning is prohibited on the Government premises.

### 3.5.3 Class I and II ODS Prohibition

Class I and II ODS are Government property and must be returned to the Government for appropriate management. Coordinate with the Installation Environmental Office to determine the required recovery cylinders and the appropriate location for turn in of all reclaimed refrigerant. Class I and II ODS as defined and identified herein shall not be used in the performance of this contract.

The contractor shall coordinate with the Refrigerant, AC and Heating Shop, (DSN 644-4302) on the quantity of ODS recovered from system for the purpose of recycle, reuse or dilution. In the event the ODS can be recycled, reused or diluted, the entire quantity will be turned over to the Refrigerant, AC and Heating shop.

In cases where the ODS is sufficiently contaminated and cannot be recycled, reused and/or diluted, the Contractor shall dispose of the ODS according to the JEGS and local regulations.

In the event of a release of ODS, base personnel and/or Contractor shall inform Fire and Emergency's Service Branch and Environmental Division.

### 3.5.4 Accidental Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer. Comply with the JEGS.

### 3.5.5 Training/Certification Requirements

Heating and air conditioning technicians must be trained to meet requirements in the JEGS. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by GOJ national or prefectural laws and regulations.

### 3.5.6 Dust Control

Keep dust down at all times, including during nonworking periods. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

#### 3.5.6.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed the JEGS and applicable U.S. Federal, GOJ national or prefectural air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods shall be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with the JEGS, GOJ national or prefectural laws and regulations, and installation requirements.

#### 3.5.6.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Installation Air Program Manager. The use of silica sand is prohibited in

sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris. Perform work involving removal of hazardous material in accordance with the JEGS, GOJ national or prefectural laws and regulations, and installation requirements.

### 3.5.7 Odors

Control odors from construction activities. The odors must be in compliance with applicable GOJ national or prefectural laws and regulations, and may not constitute a health hazard.

## 3.6 WATER RESOURCES

Keep construction activities under surveillance, management, and control, and monitor all water areas affected by construction activities in order to prevent pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination. Prevent oily wastes or other hazardous substances from entering the ground, drainage areas, or local bodies of water.

### 3.6.1 Lead-Free Drinking Water Pipe, Solders, Flux and Fittings

The maximum allowable lead content for pipes, fittings, and fixtures intended to convey or dispense water for human consumption and cooking shall be a weighted average of 0.25 percent with respect to the wetted surfaces of pipes and pipe fittings, plumbing fittings, and fixtures in accordance with NSF 61. Refer to section 22 00 00 PLUMBING, GENERAL PURPOSE.

## 3.7 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

### 3.7.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

All solid wastes and materials that have been separated for the purpose of recycling shall be stored in such a manner that they do not constitute a fire, health or safety hazard, or provide food or harborage for vectors, and shall be contained or bundled so as to not result in spillage. Containers must be: leak proof, water proof, and vermin proof including sides, seams, tops and bottoms, durable enough to withstand anticipated usage, and stored on a firm, level, well-drained surface).

### 3.7.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Environmental Office through the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been generated. Include the following in the report:

| | |
|---|---|
| Construction and Demolition (C&D) Debris Disposed | (_____) cubic meters, as appropriate |
| C&D Debris Recycled | (_____) cubic meters, as appropriate |
| Total C&D Debris Generated | (_____) cubic meters, as appropriate |
| Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount) | (_____) cubic meters, as appropriate |

## 3.8 WASTE MANAGEMENT AND DISPOSAL

### 3.8.1 Waste Determination Documentation

Complete Waste Determination Documentation for Contractor-derived wastes to be generated and submit in the Environmental Records Binder. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g. scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.8.1.1 Sampling and Analysis of Waste

3.8.1.1.1 Waste Sampling

Sample waste in accordance with the JEGS, Installation Hazardous Waste Management Plan,appropriate Japanese or U.S. EPA testing protocols that meet the purpose of the testing. Clearly mark each sampled drum or container with the Contractor's identification number, and cross reference to the chemical analysis performed.

Excess excavated soil shall become the property of the Contractor and shall be disposed of off base at a properly licensed facility in accordance with the latest version of the JEGS and applicable GOJ federal and local laws and regulations. Any excess soil shall be sampled and tested according to the applicable GOJ federal and local laws and regulations and disposal facility requirements prior to disposal.

3.8.1.1.2 Laboratory Analysis

Follow the analytical procedure and methods in accordance with the JEGS and all applicable GOJ national or prefectural laws and regulations and Installation Hazardous Waste Management Plan. Provide analytical results and reports performed to the Contracting Officer.

3.8.1.1.3 Analysis Type

Identify hazardous waste by analyzing for the following characteristics: ignitability, corrosivity, reactivity, and toxicity based on TCLP results.

3.8.2 Solid Waste Management

3.8.2.1 Solid Waste Management Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, Contractor Certification and other sales documentation in the Environmental Protection Plan. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation must include the receiver's tax identification number and business, GOJ or prefectural registration number, along with the receiver's delivery and business addresses and telephone numbers.

3.8.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements for solid waste disposal. Solid waste disposal offsite must comply with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements.

### 3.8.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer.

#### 3.8.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in the JEGS. For hazardous wastes spills, verbally notify the Contracting Officer immediately.

#### 3.8.3.2 Hazardous Waste Records

The Contractor shall maintain sampling, analysis, and turn-in records for all hazardous waste generated during the project. These records shall include, but not be limited to: waste profile sheets provided by HWSF personnel for wastes streams turned in to the HWSF, manifests (DD forms 1348-1A) for all wastes turned over to the HWSF, logs of sample locations or container identification data (including time and date of sample collection), analytical results, and quality control data provided by the analytical lab pertaining to the samples analyzed. Copies of this data shall be submitted to 718 CES/CEIE via the COR after the work is completed.

#### 3.8.3.3 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such as computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations,local requirements and installation instructions.

#### 3.8.3.4 Disposal Documentation for Hazardous and Regulated Waste

Submit a copy of the applicable local permit(s), manifest(s), or

license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities in the Environmental Records Binder. Hazardous or toxic waste manifests must be reviewed, signed, and approved by the Contracting Officer before the Contractor may ship waste. To obtain specific disposal instructions, coordinate with the Installation Environmental Office.

If the Contract specifies that the Contractor is responsible for disposal at a commercial landfill, submit copies of the following documents:

a. Copy E of the Hazardous Waste Manifest form used to transport from on-base to the off-base disposal facility (Sangyou Haikibutsu Manifesuto) within 60 days of transport.

b. Transportation company's Industrial Waste Collection and Transport Business Permit (Sangyou Haikibutsu Shuushuu Unpangyou no Kyoka) as a part of a separate Hazardous Waste Abatement Plan.

c. Disposal facility's Industrial Waste Business Permit (Sangyou Haikibutsu Shobungyou no Kyoka) as a part of a separate Hazardous Waste Abatement Plan.

### 3.8.4 Releases/Spills of Oil and Hazardous Substances

#### 3.8.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with the JEGS and installation plans. Maintain spill cleanup equipment and materials at the work site.

In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the 18 CES/CEF,Installation Fire Department (at 911 from a landline or 098-934-5911 from a cell phone), the Installation Command Duty Officer, the 718 CES Installation Environmental Office at DSN 634-2600, and the Contracting Officer.

The Contractor shall immediately report all POL or Hazardous Substances spills to the Contracting Officer. Submit verbal and written notifications as required by the JEGS and installation and service component instructions and plans, and local regulations. Provide copies of the written notification and documentation that a verbal notification was made within the timeframes required by the JEGS and installation instructions. Spill response must be in accordance with the JEGS and installation requirements. Contain and clean up these spills without cost to the Government.

Submit verbal and written notifications as required by the JEGS and installations instructions. Provide copies of the written notification and documentation that a verbal notification was made within the timeframes required by the JEGS and installation instructions. Spill response must be in accordance with the JEGS and installation requirements. Contain and clean up these spills without cost to the Government.

#### 3.8.4.2 Clean Up

The Contractor is responsible for the cleanup of POL and/or hazardous substance spills and disposal of clean-up material. The Contractor shall determine, as quickly as possible, the nature of the spilled substance and implement necessary safety precautions to protect both human health and the environment. Cleanup shall be in accordance with applicable local laws and regulations, as determined by the Fire Department and 718 CES/CEIE. Cleanup shall only be performed by personnel adequately trained in spill response and cleanup techniques for the severity of the spill incident. Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor-responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

### 3.8.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

### 3.8.6 Wastewater

Disposal of wastewater must be as specified below.

#### 3.8.6.1 Treatment

Do not allow wastewater from construction activities, such as on-site material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged without proper approval from the Contracting Officer. Dispose of the construction-related waste water off-Government property in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements, or by collecting and placing it in a retention pond where suspended material can be settled out or the water can evaporate to separate pollutants from the water. The site for the retention pond as well as its use must be coordinated and approved with the Contracting Officer. The residue left in the pond prior to completion of the project must be removed and disposed of off-Government property in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations, and installation requirements. Backfill the area to the original grade, top-soiled, and seeded or sodded. Consult with the Installation Environmental Office on specific testing requirements for water in the retention pond. If required, test the water in the retention pond and have the results reviewed and approved by the Installation Environmental Office via the Contracting Officer prior to being discharged or disposed of off-Government property.

#### 3.8.6.2 Surface Discharge

For discharge of ground water,if applicable, obtain a GOJ or local

prefectural permit specific for pumping and discharging ground water prior to surface discharging. Surface discharge in accordance with federal, state, and local laws and regulations. Surface discharge shall be done in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations and installation requirements.

#### 3.8.6.3 Land Application

Water generated from the flushing of lines after disinfection or disinfection in conjunction with hydrostatic testing must be land- applied in accordance with the JEGS and applicable Federal, GOJ, prefectural and local laws and installation requirements for land application.

## 3.9 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan, in accordance with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this Contract. Submit a Safety Data Sheet and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent.

Storage and handling of hazardous materials will adhere to the DoD Component policies, including Joint Service Publication on Storage and Handling of Hazardous Materials. Defense Logistics Agency Instruction (DLAI) 4145.11, Army Technical Manual (TM) 38-410, Naval Supply Publication (NAVSUP PUB) 573, Air Force Joint Manual (AFJMAN) 23-209, and Marine Corps Order (MCO) 4450.12A, "Storage and Handling of Hazardous Materials," January 13, 1999 provide additional guidance on the storage and handling of hazardous materials. The International Maritime Dangerous Goods (IMDG) Code and appropriate DoD and Component instructions provide requirements for international maritime transport of hazardous materials originating from DoD installations. International air shipments of hazardous materials originating from DoD installations are subject to International Civil Aviation Organization Technical Instructions or DoD Component guidance, including Air Force Manual 24-204, (Interservice) TM 38-250, NAVSUP PUB 505, MCO P4030.19J, and DLAI 4145.3, DCMAD1, Ch3.4 (HM24), "Preparing Hazardous Materials for Military Air Shipments," 3 December 2012. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with the JEGS and installation requirements.

## 3.10 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds.

## 3.11 CONTROL AND MANAGEMENT OF ASBESTOS-CONTAINING MATERIAL (ACM)

Manage and dispose of asbestos- containing waste in accordance with the

JEGS and applicable Federal, GOJ national or prefectural laws and regulations. Contact JED Environmental for the most current version of Section 02 82 00 ASBESTOS REMEDIATION. Manifest asbestos-containing waste and provide the manifest to the Contracting Officer. Notifications to the Contracting Officer and Installation Air Program Manager are required before starting any asbestos work.

Removal of mastics, necessary to achieve the contract's objectives, shall be performed in a manner as if the material contains asbestos.

When applicable, a minimum of 14 calendar days prior to the demolition or renovation of a facility that involves removing or disturbing friable ACM, the Contractor shall prepare a written assessment of friable asbestos disturbance and submit to the COR, who will, in turn submit to the Installation Commander in accordance with the JEGS.

For any previously untested material suspected to contain asbestos and located in areas impacted by the work, notify the Contracting Officer, who will order up to 20 bulk samples to be obtained and analyzed at the Contractor's expense. The Contractor shall deliver the sample(s) to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM. The laboratory shall have a working definition of "Trace" amounts of asbestos, and the laboratory shall report any detectable amount of asbestos in a bulk sample that is less than the PLM Limit of Quantification of 1 percent as a "Trace" concentration. If PLM does not detect the presence of asbestos (e.g. "non-detect"), the material shall be considered less than 0.1 percent asbestos. If PLM analysis detects asbestos in any discernible amount (to include “trace” or "less than 1 percent"), the material shall be considered greater than 0.1 percent asbestos unless proven to be non-ACM by the use of quantification methods capable of achieving an analytical sensitivity of less than 0.1 percent, such as Transmission Electron Microscopy (TEM) or 1000 point counting.

The Contracting Officer (CO) will order, testing by TEM or 1000 point counting, for up to 5 samples, to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)", for those samples with results of < 1% ACM as analyzed by PLM.

Any additional components identified as ACM that have been approved by the Contracting Officer for removal shall be removed and will be paid for by an equitable adjustment to the Contract price under the CONTRACT CLAUSE titled "changes". Sampling shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course and is AHERA certified as a "Building Inspector".

### 3.11.1 Sample Result Reporting

The contractor shall submit to the Contracting Officer a "Suspected ACM Discovery Report" within 5 days of receiving the final laboratory analysis. The report shall contain, at a minimum, a text description of the location, building and room number of the discovery, and the condition of the material; a copy of the sampler's "Building Inspector" certificate; copies of the laboratory's accreditations; a color photograph of the

sampled location; the chain of custody document; a certified copy of laboratory analysis sheet discerning the non-detect/detect threshold at 0.1 percent.

### 3.11.2 Contract Changes

ACM-related work beyond the scope of this specification, such as the removal of ACM identified by the contractor after beginning site work, must be approved by the Contracting Officer, in advance, and will be paid for by an equitable adjustment to the Contract price under the CONTRACT CLAUSE titled "changes".

### 3.11.3 New Materials

All materials provided by the Contractor shall contain less than 0.1% asbestos per weight in accordance with the JEGS. The COR may request the contractor to provide documentation from the manufacturer for any material suspected of containing asbestos to confirm asbestos content.

### 3.11.4 Flooring/Base Cove Mastic

Removal of mastics, necessary to achieve the contract's objectives, shall be performed in a manner as if the material contains asbestos.

### 3.11.5 Additional Requirements

All such work "changes" must be performed in accordance with Section 02 82 00 ASBESTOS REMEDIATION and is subject to the submittal requirements listed therein.

## 3.12 CONTROL AND MANAGEMENT OF LEAD-BASED PAINT (LBP)

Manage and dispose of lead-contaminated waste in accordance with the JEGS and all applicable Federal, GOJ national or prefectural laws and regulations and installation requirements. Contact JED Environmental for the most current version of Section 02 83 00 LEAD REMEDIATION. The Contractor is to assume that all existing paint encountered in this Contract contain detectable levels of lead, and the OSHA regulations referenced in these specification applies. Any attached lead material survey information is provided for disposal purposes only. Manifest any lead-contaminated waste and provide the manifest to the Contracting Officer.

For LBP and other lead abatement projects, refer to the JEGS and Section 02 83 00 LEAD REMEDIATION.

## 3.13 CONTROL AND MANAGEMENT OF POLYCHLORINATED BIPHENYLS (PCBS)

Manage and dispose of PCB-contaminated waste in accordance with the JEGS, installation requirements, and Section 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCB). Purchase of electrical equipment and transformers containing PCBs is prohibited.

## 3.14 CONTROL AND MANAGEMENT OF LIGHTING BALLAST AND LAMPS CONTAINING PCBS

Manage and dispose of contaminated waste in accordance with the JEGS and installation requirements. Contact JED Environmental for the most current version of Section 02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS

CONTAINING PCBS AND MERCURYERCURY.

## 3.15 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with the JEGS and installation requirements. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of Japan. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of oil, including fuel, on the project site is not allowed. Fuel must be brought to the project site each day that work is performed. Storage of fuel on the project site must be in accordance with the JEGS and installation requirements, and local laws and regulations and paragraph OIL STORAGE INCLUDING FUEL TANKS.

### 3.15.1 Used Oil Management

"Used oil," means any oil or other waste petroleum, oil, or lubricant (POL) product that has been refined from crude oil, or is synthetic oil, has been used and as a result of such use, is contaminated by physical or chemical impurities, or is off specification and cannot be used as intended. Although used oil may exhibit the characteristics of reactivity, toxicity, ignitability, or corrosivity, it is still considered used oil, unless it has been mixed with hazardous waste. Manage used oil generated on site in accordance with the JEGS and installation requirements. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

### 3.15.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 12 centimeters freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 5000 liter will be used onsite (only containers with a capacity of 208 liter or greater are counted), provide and implement a SPCC plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from

a containment dike to the environment, to determine there is no oil sheen present.

## 3.16 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

## 3.17 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA or Japanese equivalent. Blasting or use of explosives are not permitted without written permission from the Contracting Officer, and then only during the designated times. Confine pile-driving operations to the period between 0800 and 1600, Monday through Friday, exclusive of holidays, unless otherwise specified.

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the 29 CFR 1910, and applicable GOJ, U.S. Federal, and local rules and regulations.

## 3.18 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause CLEANING UP. Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade and seed disturbed areas to conform to surrounding contours.

-- End of Section --

EnviroQuest

SERVICES

HAZMAT Inspections

Remediation Design

Asbestos Management

Lead Management

Lead Risk Assessment

Industrial Hygiene

Indoor Air Quality

Mold Assessment

Environmental Site Assessments

Subsurface Investigation

Water Sampling

Asbestos Training

Lead Training

OSHA Training

OSHA Compliance

# INSPECTION REPORT FOR ASBESTOS, LEAD-BASED PAINT, CHROMIUM, CADMIUM, PCBS, AND MISCELLANEOUS HAZARDOUS MATERIALS

REPAIR COURTNEY TOWER 4511
CAMP COURTNEY, OKINAWA, JAPAN

EnviroQuest Project: 300872.02

June 2023

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# EXECUTIVE SUMMARY

EnviroQuest, Inc. has been contracted by the Exp Federal to conduct a hazardous material survey at Courtney Tower 4511, Camp Courtney, Okinawa, Japan. The survey was conducted between April 3 through 8 2023.

The objective of the survey was to determine the locations and quantities of asbestos-containing materials (ACMs), lead-based paints (LBPs), fluorescent light fixtures that may contain polychlorinated biphenyl's (PCBs), smoke detectors and thermostats that may contain mercury and possible low-level radioactive materials, and cooling equipment that may contain ozone-depleting substances (ODS).

The listed areas were included in our inspection:

- Living quarters
  - Units 104, 201, 403, 502 and 908
- Common areas
  - Hallways/Elevator Lobby
    - 1st, 3rd, 6th, 7th and 8th floors
  - Mechanical and Electrical rooms
  - Multi-purpose room/bike storage
- Penthouse/Roof

Note:

- All units and common areas were subject to a visual inspection.
- Ground transformers were inaccessible at the time of inspection and were not tested for PCBs.

<u>Asbestos Containing Material</u>

The listed materials were identified as asbestos-containing materials.

| Material | Description | Location | Condition |
|---|---|---|---|
| Off-white widow caulking | Window frames | Interior window frames on all units | Good |
| Gray covebase mastic | Under light brown covebase | All units | Good |
| White pipe penetration wall sealant | Ceiling plenum | Located at pipe penetrations. All floor levels 1-9 | Good |

The ACM was found to be in good condition and no immediate abatement action is necessary. If the ACM will be disturbed as part of the renovation work, the material must be removed prior to the renovation and all removal must be completed by a certified asbestos abatement contractor under controlled conditions in accordance with EPA regulations. Work should also be monitored by an independent industrial hygiene professional.

*Lead, Cadmium and Chromium*

The listed building components were identified with lead, cadmium or chromium paint.

| Color | Description | Location | Pb | Cd | Cr |
|---|---|---|---|---|---|
| Beige over brown | Metal entry door and frame | All unit's | X | | X |
| Beige over yellow | Metal exit door and frame | Exit door to the stairs. Adjacent to the master bedroom, | X | | X |
| Green over orange | Metal stair handrail | 1st floor; mechanical room L18 | X | | X |
| Light-brown over yellow | Metal doorframe | Stairway adjacent to the elevator lobby. All floors. | X | | |
| Tan over yellow | Metal door | Stairway adjacent to the elevator lobby. All floors. | X | | X |
| Green over orange | Metal stair handrail and railing | Stairway adjacent to the elevator lobby<br><br>Stairway at adjacent to the master bedroom and elevator lobby.<br><br>All floor levels. | X | | X |
| Red | Fire suppression piping | All fire piping throughout building. | X | | X |
| Beige | Metal fence post | Roof perimeter fence and post | X | X | |
| Silver over yellow | Metal ventilation duct | 1st floor; common area; mechanical room L18 | | X | X |
| Beige over yellow | Metal piping | Multipurpose storage room L12 | | X | X |
| Brown over beige | Concrete baseboard | Common areas; elevator lobby, hallway, and adjacent staircase, etc. All floor levels | | | X |
| Gray | Metal framing | 1st floor; common area; mechanical room L1 | | | X |

If the paint is likely to be disturbed during the renovation work, the paint or coating should be removed at the point of disturbance prior to any renovation activities. Work should also be monitored by an independent industrial hygiene professional.

Disturbance to any lead, cadmium, and chromium containing paints must be conducted in accordance with OSHA *29 CFR 1926.55 Gases, Vapors, Fumes, Dusts and Mists;* 29 CFR 1926.62 *Lead; 29 CFR 1926.1126 Chromium and 29 CFR 1926.1127 Cadmium.*

Poly-Chlorinated Biphenyls (PCB)

PCBs were not identified in the ballasts examined. However, Regulatory differences between US and GOJ definitions of "PCB Free" may require that the removal and disposal of any ballasts be completed in accordance with Chapter 7 of the JEGS and EPA 40 CFR 761 *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions*.

Fluorescence lighting (e.g., lamps, tubes, CFLs, etc.) are known to contain a measurable amount of mercury. If removed, they should be collected and recycled or disposed of in accordance with the JEGS and EPA 40 CFR 273, *Standards for Universal Waste Management*.

Ground transformers were observed however the oils were not tested for PCBs due to inaccessibility to the transformers. These transformers should be assumed to contain PCBs and should be collected and disposed of or recycled in accordance with EPA regulations and the JEGS unless proven otherwise.

All electrical ballasts and high voltage transformers must be turned into Kadena Environmental so proper determination of PCB content can be performed.

Mercury and Low-Level Radioactive Materials

Smoke detectors were observed in the living quarters. If the detectors are to be replaced, the detectors should be collected and recycled or disposed of in accordance with the JEGS and the DoD document 4715.6-R *Low Level Radioactive Waste Disposal Program*.

Mercury containing thermostats and tritium EXIT signs were not identified in the building.

An estimated 360 smoke detectors are present in the building. The detectors should be assumed to contain americium-214, collected and recycled or disposed of in accordance with the JEGS and the DoD document 4715.6-R *Low Level Radioactive Waste Disposal Program.*

Chlorofluorocarbon-Containing Equipment

Refrigerant containing equipment (fan coil units and cooling tower) are presumed to contain CFCs. The refrigerants should be collected and recycled or disposed of in accordance with the EPA regulations and guidelines and the JEGS unless they are proven to be CFC free.

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# 1 INTRODUCTION

A hazardous building material survey (HBMS) was conducted on April 3 through 8, 2023 at Courtney Tower 4511, Camp Courtney, Okinawa, Japan.

The purpose of the activities under this project was to perform an inspection of the building for asbestos-containing materials (ACMs), lead-based paints (LBPs), chromium (Cr), cadmium (Cd), and to inventory “other regulated materials” (ORM) e.g., light ballasts containing polychlorinated biphenyls (PCBs), mercury containing thermostats, refrigerants, smoke detectors, etc.

## 1.1 SITE LOCATION

The listed areas were included in our inspection.

- Living quarters
  - Units 104, 201, 403, 502 and 908
- Common areas
  - Hallways/Elevator Lobby
    - 1st, 3rd, 6th, 7th and 8th floors
  - Mechanical and Electrical rooms
  - Multi-purpose room/bike storage
- Penthouse/Roof

Note:

- All units and common areas were subject to a visual inspection.
- Ground transformers were inaccessible at the time of inspection and were not tested for PCBs.

# 2 ASBESTOS

Two hundred ninety samples were collected from suspect asbestos-containing materials.

## 2.1 METHODOLOGY

A visual inspection for suspect ACM and homogeneous areas (areas that have uniform color, texture, and appearance) was conducted. Suspect materials were divided into three Environmental Protection Agency (EPA) categories:

- Surfacing Materials (sprayed or troweled-on materials)
- Thermal Systems Insulations (materials generally applied to various mechanical systems)
- Miscellaneous Materials (any materials which do not fit in the above categories)

Sampling methodology generally followed the procedures presented in EPA 40 CFR 763 (AHERA) of the Code of Federal Regulations and the 2022 Japan Environmental Governing Standards (JEGS).

## 2.2 RESULTS

Samples were submitted to Hawaii Analytical Laboratory in Honolulu, Hawaii, a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory. The samples were analyzed by polarized-light microscopy (PLM), using EPA Method 600/R-93-116, *Visual Area Estimation*.

Based on the laboratory analytical results, asbestos was identified in four of the 290 samples. The samples were determined to be asbestos-containing materials (ACM), materials containing more than 0.1% asbestos, as determined using the methods specified in Appendix E, Subpart E, 40 CFR part 763, Section 1, Polarized Light Microscopy.

In accordance with the requirements of the National Emission Standard for Hazardous Air Pollutants (NESHAP), 40 CFR 61 Part M, samples consisting of distinct layers of materials were analyzed and reported separately by the laboratory. Asbestos determination was based on the JEGS which states, *if PLM does not detect the presence of asbestos (e.g., "non-detect"), consider the material to be less than 0.1 percent asbestos. If PLM analysis detects asbestos in any discernible amount (to include "trace" or "less than 1%"), consider the material to be greater than 0.1 percent asbestos unless proven to be non-ACM by the use of testing methods capable of achieving an LOQ of less than 0.1 percent, such as Transmission Electron Microscopy (TEM) or 1000 point counting*. No samples were point counted for this report.

Refer to the accompanying appendices for details on material sample summary tables, sample locations, results, and photographs.

# 3 LEAD, CADMIUM, AND CHROMIUM IN PAINT

Forty-six paint film samples were collected for lead, cadmium, and chromium analysis. The samples were collected from painted or coated materials that may be disturbed by the renovation work.

## 3.1 METHODOLOGY

A visual inspection for painted or coated building surfaces were conducted. Sampling methodology generally followed the procedures presented in the U.S. Department of Housing and Urban Development's document *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* and EPA 40 CFR 745 *Lead-Based Paint Poisoning Prevention in Certain Residential Structures.*

## 3.2 RESULTS

Samples for lead, cadmium, and chromium analysis were submitted to Hawaii Analytical Laboratory, LLC. Hawaii Analytical Laboratory is an American Industrial Hygiene Association (AIHA) accredited laboratory with a specific accreditation for lead analysis the under AIHA Environmental Lead Laboratory Accreditation Program. Lead analysis was completed by NIOSH Method 7082m, *Flame Atomic Absorption Spectrophotometry.* The cadmium, and chromium samples were analyzed by EPA Method 3051m / 7000Bm.

Based on the laboratory analytical results, eight of the 46 samples exceeded the EPA guidelines for lead in paint. The EPA defines lead-based paint as paint or other coatings containing lead equal to, or in excess of, 0.5% lead by weight. Lead at concentrations below the EPA guidelines were also detected. For the purpose of this report, these paints are identified as paint with lead (PWL), lead greater than the laboratory detection limit but less than 0.5% lead by weight.

Cadmium and chromium were also detected in various samples. While there are no specific EPA regulations addressing the remediation of cadmium and chromium paints, the Occupational Safety and Health Administration (OSHA) does have regulations to ensure a safe and healthful working environment for workers.

Disturbance to any lead, cadmium, and chromium containing paints must be conducted in accordance with OSHA *29 CFR 1926.55 Gases, Vapors, Fumes, Dusts and Mists;* 29 CFR 1926.62 *Lead; 29 CFR 1926.1126 Chromium and 29 CFR 1926.1127 Cadmium.*

If any untested paints are disturbed, they should be assumed to contain lead, cadmium, and chromium. Refer to the accompanying appendices for the sample laboratory analytical results and photographs.

# 4 POLYCHLORINATED BIPHENYLS

A visual survey of the building was conducted to identify fluorescent light fixtures and transformers.

## 4.1 METHODOLOGY

Light fixtures were selected as randomly as feasible to be a representative cross section of the project area. The light fixtures were dismantled to expose the ballasts for inspection. If a ballast was marked with a manufacturer's label stating, "NO PCB", the ballast was presumed to be PCB free. Ballasts missing the label were presumed to contain PCB's. It was not part of this work scope to examine every light fixture in the building.

Ground level transformers were also observed. The transformers were inaccessible during the inspection, therefore, the oils were unable to be tested or verified.

## 4.2 Results

Approximately six hundred twenty-eight light fixtures were identified in the project area. Sixty-two light fixtures, approximately 10%, were examined. All ballasts examined were a newer USA electronic type of ballast. PCB ballasts were not identified in the fluorescent light fixtures examined. If a light ballast is missing a manufacturer's label stating "NO PCB" or is different from the ballasts examined, the ballast should be assumed to contain PCBs, removed from the light fixture, and disposed of in accordance with EPA regulations and the JEGS.

It must be noted for the purposes of this report that a "No PCBs" label on a US manufactured ballast does not necessarily equate to "PCB Free" within Japan. Due to regulatory differences between US and Government of Japan (GOJ) definitions for what is considered to be "PCB Free," ballasts may still contain PCBs even when a "No PCBs" marking is present on the ballast label.

The fluorescent light tubes are known to contain measurable amounts of mercury and should also be collected and recycled in accordance with EPA regulations and the JEGS.

Four transformers were observed. However, the manufacturer's placard was missing on all four of the transformers. These transformers should be assumed to contain PCBs and should be collected and disposed of or recycled in accordance with EPA regulations and the JEGS unless proven otherwise.

# 5 MERCURY AND LOW-LEVEL RADIOACTIVE MATERIALS

Modern HVAC systems generally utilize thermocouple-type thermostats that are “liquid-free”; however, some older systems utilized thermostats or other thermometers that contained liquids. The presence of blue and/or red liquids is an indication that the thermometer/thermostat utilizes alcohol or another non-hazardous temperature sensing liquid. Mercury-containing thermometers or thermostats typically contained a silver liquid.

According to the US EPA and Nuclear Regulatory Commission common ionization chamber smoke detectors, the most common type, use small amounts of radioactive material to detect smoke.

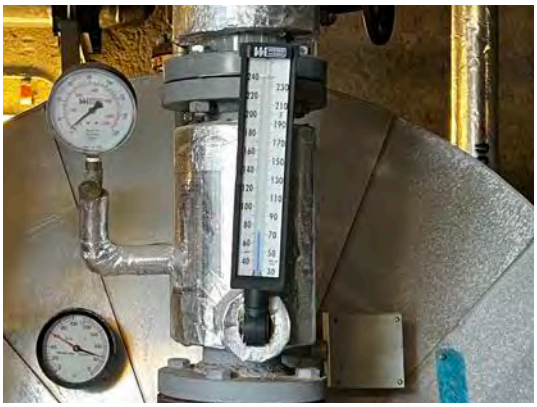
EXIT signs that glow in the dark often contain a radioactive gas called tritium.

## 5.1 METHODOLOGY

A visual inspection was conducted for thermostats and thermometers, smoke detectors, and EXIT signs.

## 5.2 RESULTS

Seven non-mercury containing blue liquid temperature sensing liquid thermostats were observed at the 1st floor mechanical room L18.



Approximately three hundred thirty smoke detectors were observed throughout the building. All detectors should be assumed to contain americium-214 and should be collected and disposed of in accordance with EPA regulations and the JEGS.

Thirty-two EXIT signs were observed throughout the building. All signs had a separate electrical illumination source. Glow-in-the-dark signs, characteristic of containing tritium, were not observed.

# 6 CHLOROFLUOROCARBON (CFC)-CONTAINING EQUIPMENT

Older chiller units utilized ozone depleting refrigerants.

## 6.1 METHODOLOGY

A visual inspection was conducted for CFC containing equipment.

## 6.2 RESULTS

Approximately three hundred sixty (360) vertical fan coil units and two cooling towers were observed. The refrigerant used in the cooling towers was unable to be verified during the inspection due to inaccessibility issues. Although unlikely, due to the presumed age of the system, the refrigerant should be assumed to contain CFCs until verification can be determined. Until proven to be CFC free, the refrigerants should be collected and disposed of or recycled in accordance with EPA regulations and the JEGS.

# 7 SUMMARY

## 7.1 ASBESTOS

The listed materials were identified as asbestos-containing materials.

| Material | Description | Location | Condition |
|---|---|---|---|
| Off-white widow caulking | Window frames | Interior window frames on all units | Good |
| Gray covebase mastic | Under light brown covebase | All units | Good |
| White pipe penetration wall sealant | Ceiling plenum | Located at pipe penetrations. All floor levels 1-9 | Good |

The ACM was found to be in good condition and no immediate abatement action is necessary. If the ACM will be disturbed as part of the renovation work, the material must be removed prior to the renovation and all removal must be completed by a certified asbestos abatement contractor under controlled conditions in accordance with EPA regulations. Work should also be monitored by an independent industrial hygiene professional.

## 7.2 LEAD, CADMIUM, AND CHROMIUM

### 7.2.1 Lead, Cadmium, and Chromium:

The listed building components were identified with lead, cadmium or chromium paint.

| Color | Description | Location | Pb | Cd | Cr |
|---|---|---|---|---|---|
| Beige over brown | Metal entry door and frame | All unit's | X | | X |
| Beige over yellow | Metal exit door and frame | Exit door to the stairs. Adjacent to the master bedroom, | X | | X |
| Green over orange | Metal stair handrail | 1st floor; mechanical room L18 | X | | X |
| Light-brown over yellow | Metal doorframe | Stairway adjacent to the elevator lobby. All floors. | X | | |
| Tan over yellow | Metal door | Stairway adjacent to the elevator lobby. All floors. | X | | X |
| Green over orange | Metal stair handrail and railing | Stairway adjacent to the elevator lobby<br><br>Stairway at adjacent to the master bedroom and elevator lobby.<br><br>All floor levels. | X | | X |
| Red | Fire suppression piping | All fire piping throughout building. | X | | X |
| Beige | Metal fence post | Roof perimeter fence and post | X | X | |
| Silver over yellow | Metal ventilation duct | 1st floor; common area; mechanical room L18 | | X | X |
| Beige over yellow | Metal piping | Multipurpose storage room L12 | | X | X |

| Color | Description | Location | Pb | Cd | Cr |
|---|---|---|---|---|---|
| Brown over beige | Concrete baseboard | Common areas; elevator lobby, hallway, and adjacent staircase, etc. All floor levels | | | X |
| Gray | Metal framing | 1st floor; common area; mechanical room L1 | | | X |

If the paint is likely to be disturbed during the renovation work, the paint or coating should be removed at the point of disturbance prior to any renovation activities. Work should also be monitored by an independent industrial hygiene professional.

Disturbance to any lead, cadmium, and chromium containing paints must be conducted in accordance with OSHA *29 CFR 1926.55 Gases, Vapors, Fumes, Dusts and Mists;* 29 CFR 1926.62 *Lead; 29 CFR 1926.1126 Chromium and 29 CFR 1926.1127 Cadmium.*

## 7.3 POLYCHLORINATED BIPHENYL BALLAST

PCBs were not identified in the ballasts examined. However, Regulatory differences between US and GOJ definitions of "PCB Free" may require that the removal and disposal of any ballasts be completed in accordance with Chapter 7 of the JEGS and EPA 40 CFR 761 *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions*.

Fluorescence lighting (e.g., lamps, tubes, CFLs, etc.) are known to contain a measurable amount of mercury. If removed, they should be collected and recycled or disposed of in accordance with the JEGS and EPA 40 CFR 273, *Standards for Universal Waste Management*.

No ground transformer containing PCB oil were tested during this inspection. These transformers should be assumed to contain PCBs and should be collected and disposed of or recycled in accordance with EPA regulations and the JEGS unless proven otherwise.

All electrical ballasts and high voltage transformers must be turned into Kadena Environmental so proper determination of PCB content can be performed.

## 7.4 MERCURY AND LOW-LEVEL RADIOACTIVE MATERIALS

Mercury containing thermostats and tritium EXIT signs were not identified in the building.

An estimated 360 smoke detectors are present in the building. The detectors should be assumed to contain americium-214, collected and recycled or disposed of in accordance with the JEGS and the DoD document 4715.6-R *Low Level Radioactive Waste Disposal Program.*

## 7.5 CHLOROFLUOROCARBON-CONTAINING EQUIPMENT

Refrigerant containing equipment (fan coil units and cooling tower) are presumed to contain CFCs. The refrigerants should be collected and recycled or disposed of in accordance with the EPA regulations and guidelines and the JEGS unless they are proven to be CFC free.

# 8 LIMITATIONS

The information set forth is based solely on the agreed upon scope of services, on personal observation, laboratory data, and information provided by the exp Federal.

Although this inspection provides information on the relative presence or absence of asbestos-containing materials, lead-based paint, chromium, cadmium, polychlorinated biphenyl, and miscellaneous hazardous materials, it should not be construed as a final statement that all hazardous materials have been identified.

Given the often obscure and elusive nature of hazardous materials, it is never possible to absolutely dismiss the possibility of additional hazardous materials. EnviroQuest, Inc. expressly disclaims any and all liability, representations, expressed or implied, contained in, or for omission from this report, or any other written or oral communication which might be interpreted as establishing the total extent of all liability present at the subject property.

Our services have been performed with usual thoroughness and competence of the consulting profession, in accordance with the standard of professional services at this time. No other warranty or representation, either expressed or implied is included or intended.

Any question regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned. EQI greatly appreciates this opportunity to assist you with your industrial hygiene needs. We look forward to working with you again in the future.

**TABLE 1: ASBESTOS SAMPLE SUMMARY**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| 12”X12” beige vinyl floor tile with tan mastic | N | Unit 502; kitchen floor | 300872.02-502-01A | N | G |
| | N | Unit 502; hallway floor | 300872.02-502-02A | | |
| 12”X12” beige vinyl floor tile with tan mastic and gray concrete coating | N | Unit 104; hallway closet floor | 300872.02-104-01A | N | G |
| | N | Unit 201; kitchen floor | 300872.02-201-01A | | |
| | N | Unit 403; bedroom 2 closet floor | 300872.02-403-01A | | |
| | N | Unit 908; kitchen floor | 300872.02-908-01A | | |
| 12”x12” tan vinyl floor tile with tan mastic over concrete coating | N | 1st floor; common area; janitor closet floor | 300872.02-C1-02A | N | G |
| | N | 3rd floor; common area; room EBS C10C floor | 300872.02-C3-02A | | |
| | N | 6th floor; common area; room EBS C10D floor | 300872.02-C6-03A | | |
| | N | 6th floor; common area; room EBS C10G floor | 300872.02-C6-04A | | |
| | N | 7th floor; common area; room EBS C10G floor | 300872.02-C7-02A | | |
| | N | 8th floor; common area; room EBS C10G floor | 300872.02-C8-02A | | |
| 12”x12” off-white vinyl floor tile with gray mastic over concrete coating | N | 1st floor; common area; stair 1 floor | 300872.02-C1-03A | N | G |
| | N | 3rd floor; common area; stair 1 floor | 300872.02-C3-04A | | |
| | N | 6th floor; common area; stair 1 floor | 300872.02-C6-07A | | |
| | N | 6th floor; common area; stair 1 floor | 300872.02-C6-08A | | |
| | N | 7th floor; common area; stair 1 floor | 300872.02-C7-04A | | |
| | N | 8th floor; common area; stair 1 floor | 300872.02-C8-04A | | |
| 4”x4” gray ceramic floor tile with grout and mortar | N | Unit 104; hallway restroom floor | 300872.02-104-13A | N | G |
| | N | Unit 201; hallway restroom floor | 300872.02-201-13A | | |
| | N | Unit 403; master bedroom restroom floor | 300872.02-403-13A | | |
| | N | Unit 502; hallway restroom floor | 300872.02-502-27A | | |
| | N | Unit 502; master bedroom restroom floor | 300872.02-502-28A | | |
| | N | Unit 908; master bedroom restroom floor | 300872.02-908-13A | | |
| 6”x6” red quarry tile and grout over mortar | N | 1st floor; common area; room EBS L10C | 300872.02-C1-07A | N | G |
| | N | 1st floor; common area; room EBS L10C | 300872.02-C1-08A | | |
| Gray concrete coating | N | Unit 502; kitchen floor | 300872.02-502-03A | N | G |
| | N | Unit 502; hallway floor | 300872.02-502-04A | | |
| | N | Roof; mechanical room P04 | 300872.02-R-11A | | |
| | N | Lower roof; adjacent to unit 201 | 300872.02-R-13A | | |
| | N | | 300872.02-R-14A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Gray concrete (Collected approximately 2mm below surface) | N | 3rd floor; common area; room EBS C10C floor | 300872.02-C3-03A | N | G |
| | N | 6th floor; common area; room EBS C10D floor | 300872.02-C6-05A | | |
| | N | 6th floor; common area; room EBS C10G floor | 300872.02-C6-06A | | |
| | N | 7th floor; common area; room EBS C10G floor | 300872.02-C7-03A | | |
| | N | 8th floor; common area; room EBS C10G floor | 300872.02-C8-03A | | |
| | N | Unit 104; hallway closet floor | 300872.02-104-02A | | |
| | N | Unit 201; kitchen floor | 300872.02-201-02A | | |
| | N | Unit 403; bedroom 2 closet floor | 300872.02-403-02A | | |
| | N | Unit 502; kitchen floor | 300872.02-502-05A | | |
| | N | Unit 502; hallway floor | 300872.02-502-06A | | |
| | N | Unit 908; kitchen floor | 300872.02-908-02A | | |
| | N | Roof; mechanical room P04 | 300872.02-R-12A | | |
| 4" light-brown vinyl cove base with tan/gray mastic | N | Unit 104; kitchen/pantry cove base | 300872.02-104-05A | **N** | **G** |
| | N | Unit 201; laundry cove base | 300872.02-201-05A | | |
| | N | Unit 403; hallway closet cove base | 300872.02-403-05A | | |
| | **Y (Gray mastic)** | **Unit 502; master bedroom closet cove base** | **300872.02-502-11A** | | |
| | N | Unit 502; hallway cove base | 300872.02-502-12A | | |
| | N | Unit 908; hallway closet cove base | 300872.02-908-05A | | |
| 4" light-brown cove base with tan mastic | N | 3rd floor; common area; room EBS C10G cove base | 300872.02-C3-07A | N | G |
| | N | 6th floor; common area; room EBS C10G cove base | 300872.02-C6-13A | | |
| | N | 6th floor; common area; room EBS C10G cove base | 300872.02-C6-14A | | |
| | N | 7th floor; common area; room EBS C10G cove base | 300872.02-C7-07A | | |
| | N | 8th floor; common area; room EBS C10G cove base | 300872.02-C8-07A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Off-white interior door caulking | N | Unit 104; laundry room door | 300872.02-104-03A | N | G |
| | N | Unit 201; bedroom 3 door | 300872.02-201-03A | | |
| | N | Unit 403; laundry room door | 300872.02-403-03A | | |
| | N | Unit 502; entry door | 300872.02-502-07A | | |
| | N | Unit 502; restroom door | 300872.02-502-08A | | |
| | N | Unit 908; master bedroom restroom door | 300872.02-908-03A | | |
| Gray exterior door caulking | N | Unit 104; dining room/balcony sliding door | 300872.02-104-11A | N | G |
| | N | Unit 201; dining room/balcony sliding door | 300872.02-201-11A | | |
| | N | Unit 403; dining room/balcony sliding door | 300872.02-403-11A | | |
| | N | Unit 502; dining room/balcony sliding door | 300872.02-502-23A | | |
| | N | Unit 502; master bedroom/balcony sliding door | 300872.02-502-24A | | |
| | N | Unit 908; dining room/balcony sliding door | 300872.02-908-11A | | |
| Beige painted gray door caulking | N | 1st floor; common area; restroom door | 300872.02-C1-01A | N | G |
| | N | 3rd floor; common area; unit 301 door | 300872.02-C3-01A | | |
| | N | 6th floor; common area; pipe chase C04 door | 300872.02-C6-01A | | |
| | N | 6th floor; common area; unit 608 door | 300872.02-C6-02A | | |
| | N | 7th floor; common area; pipe chase C03 door | 300872.02-C7-01A | | |
| | N | 8th floor; common area; unit 808 door | 300872.02-C8-01A | | |
| **Off-white interior window caulking** | N | Unit 104; bedroom 3 window | 300872.02-104-04A | **N** | **G** |
| | N | Unit 201; bedroom 2 window | 300872.02-201-04A | | |
| | **Y** | **Unit 403; master bedroom window** | **300872.02-403-04A** | | |
| | N | Unit 502; master bedroom window | 300872.02-502-09A | | |
| | N | Unit 502; bedroom 2 window | 300872.02-502-10A | | |
| | N | Unit 908; bedroom 2 window | 300872.02-908-04A | | |
| Gray exterior window caulking | N | Unit 104; bedroom 3 window | 300872.02-104-12A | N | G |
| | N | Unit 201; dining/balcony window | 300872.02-201-12A | | |
| | N | Unit 403; bedroom 2 window | 300872.02-403-12A | | |
| | N | Unit 502; kitchen/balcony window | 300872.02-502-25A | | |
| | N | Unit 502; dining/balcony window | 300872.02-502-26A | | |
| | N | Unit 908; bedroom 3 window | 300872.02-908-12A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Gray sealant | N | Unit 104; balcony base railing sealant | 300872.02-104-10A | N | G |
| | N | Unit 201; balcony base railing sealant | 300872.02-201-10A | | |
| | N | Unit 403; balcony base railing sealant | 300872.02-403-10A | | |
| | N | Unit 502; balcony base railing sealant | 300872.02-502-21A | | |
| | N | | 300872.02-502-22A | | |
| | N | Unit 908; balcony base railing sealant | 300872.02-908-10A | | |
| **White pipe penetration wall sealant** | N | Unit 104; kitchen above ceiling | 300872.02-104-16A | **N** | **G** |
| | **Y** | **Unit 201; master bedroom restroom above ceiling** | **300872.02-201-17A** | | |
| | **Y** | **Unit 201; master bedroom restroom above ceiling** | **300872.02-201-18A** | | |
| | **Y** | **Unit 403; master bedroom restroom above ceiling** | **300872.02-403-16A** | | |
| Red pipe penetration sealant | N | Unit 104; kitchen above the ceiling | 300872.02-104-17A | N | G |
| | N | 1st floor; common area; mech/elect room L07 | 300872.02-C1-11A | | |
| | N | 3rd floor; common area; mechanical/electrical room C08 pipe penetration | 300872.02-C3-11A | | |
| | N | 6th floor; common area; mech/elect room C08 pipe penetration | 300872.02-C6-21A | | |
| | N | 6th floor; common area; mech/elect room C08 pipe penetration | 300872.02-C6-22A | | |
| | N | 7th floor; common area; mech/elect room C08 pipe penetration | 300872.02-C7-11A | | |
| | N | 8th floor; common area; mech/elect room C08 pipe penetration | 300872.02-C8-11A | | |
| Silver painted black AC duct joint sealant | N | 1st floor; common area; mech/elect room L07 | 300872.02-C1-10A | N | G |
| | N | 3rd floor; common area; storage C07 AC duct | 300872.02-C3-12A | | |
| | N | 6th floor; common area; storage C07 AC duct | 300872.02-C6-23A | | |
| | N | 6th floor; common area; storage C07 AC duct | 300872.02-C6-24A | | |
| | N | 7th floor; common area; mech room C08 AC duct | 300872.02-C7-12A | | |
| | N | 8th floor; common area; mech room C07 AC duct | 300872.02-C8-12A | | |
| | N | Roof; mechanical room P04 | 300872.02-R-07A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Drywall and joint compound | N | Unit 104; kitchen/pantry wall | 300872.02-104-06A | N | G |
| | N | Unit 104; kitchen/pantry ceiling | 300872.02-104-07A | | |
| | N | Unit 201; kitchen/pantry wall | 300872.02-201-06A | | |
| | N | Unit 201; kitchen/pantry ceiling | 300872.02-201-07A | | |
| | N | Unit 403; Pantry room wall partition | 300872.02-403-06A | | |
| | N | Unit 403; Pantry room ceiling | 300872.02-403-07A | | |
| | N | Unit 502; bedroom 2 closet wall partition | 300872.02-502-13A | | |
| | N | Unit 502; bedroom 3 wall partition | 300872.02-502-14A | | |
| | N | Unit 502; laundry ceiling | 300872.02-502-15A | | |
| | N | Unit 502; kitchen soffit | 300872.02-502-16A | | |
| | N | Unit 908; master bedroom closet wall partitions | 300872.02-908-06A | | |
| | N | Unit 908; master bedroom ceiling | 300872.02-908-07A | | |
| | N | 1st floor; common area; restroom ceiling soffit | 300872.02-C1-05A | | |
| | N | 1st floor; common area; restroom wall partitions | 300872.02-C1-06A | | |
| | N | 3rd floor; common area; hallway/room EBS C10G | 300872.02-C3-06A | | |
| | N | 3rd floor; common area; room EBS C10G wall | 300872.02-C3-08A | | |
| | N | 6th floor; common area; hallway/room EBS C10G ceiling soffit | 300872.02-C6-11A | | |
| | N | 6th floor; common area; hallway/room EBS C10G ceiling soffit | 300872.02-C6-12A | | |
| | N | 6th floor; common area; room EBS C10G wall | 300872.02-C6-15A | | |
| | N | 6th floor; common area; room EBS C10G wall | 300872.02-C6-16A | | |
| | N | 7th floor; common area; room EBS C10G ceiling | 300872.02-C7-06A | | |
| | N | 7th floor; common area; room EBS C10G wall | 300872.02-C7-08A | | |
| | N | 8th floor; common area; hallway/room EBS C10G ceiling soffit | 300872.02-C8-06A | | |
| | N | 8th floor; common area; room EBS C10G wall | 300872.02-C8-08A | | |
| Beige exterior textured wall coating with gray cementitious material | N | Unit 104; dining room balcony wall | 300872.02-104-15A | N | G |
| | N | Unit 201; dining room balcony wall | 300872.02-201-14A | | |
| | N | Unit 403; dining room balcony wall | 300872.02-403-15A | | |
| | N | Unit 502; dining room balcony wall | 300872.02-502-31A | | |
| | N | Unit 502; master bedroom balcony wall | 300872.02-502-32A | | |
| | N | Unit 908; dining room balcony wall | 300872.02-908-15A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Beige exterior textured wall coating with gray cementitious material | N | Exterior wall of the tower; Area B | 300872.02-C1-32A | N | G |
| | N | Exterior wall of the tower; Area D | 300872.02-C1-33A | | |
| | N | Exterior wall of the tower; Area A | 300872.02-C1-34A | | |
| | N | Roof; staircase exterior wall | 300872.02-R-01A | | |
| Gray concrete wall coating | N | Unit 104; laundry room above ceiling | 300872.02-104-21A | N | G |
| | N | Unit 201; laundry room above ceiling | 300872.02-201-21A | | |
| | N | Unit 403; laundry room above ceiling | 300872.02-403-18A | | |
| | N | Unit 502; laundry room above ceiling | 300872.02-502-35A | | |
| | N | | 300872.02-502-36A | | |
| | N | Unit 908; laundry room above ceiling | 300872.02-908-18A | | |
| | N | 1st floor; common area; mech/elect room L07 wall sidings | 300872.02-C1-18A | | |
| | N | 1st floor; common area; stair 1 wall sidings | 300872.02-C1-18A2 | | |
| | N | 1st floor; common area; mech/elect room L07 wall sidings | 300872.02-C1-19A | | |
| | N | 1st floor; common area; stair 1 wall sidings | 300872.02-C1-19A2 | | |
| | N | 3rd floor; common area; mech/elect room C08 wall sidings | 300872.02-C3-16A | | |
| | N | 3rd floor; common area; stair 1 wall sidings | 300872.02-C3-16A2 | | |
| | N | 6th floor; common area; mech/elect room C08 wall sidings | 300872.02-C6-31A | | |
| | N | 6th floor; common area; mech/elect room C08 wall sidings | 300872.02-C6-32A | | |
| | N | 6th floor; common area; stair 1 wall sidings | 300872.02-C6-32A2 | | |
| | N | 7th floor; common area; mech/elect room C08 wall sidings | 300872.02-C7-16A | | |
| | N | 8th floor; common area; mech/elect room C08 wall sidings | 300872.02-C8-16A | | |
| | N | 3rd floor; common area; mech/elect room C08 | 300872.02-C3-15A | | |
| | N | 3rd floor; common area; stair 1 wall | 300872.02-C3-15A2 | | |
| | N | 6th floor; common area; mech/elect room C08 | 300872.02-C6-29A | | |
| | N | 6th floor; common area; mech/elect room C08 | 300872.02-C6-30A | | |
| | N | 6th floor; common area; stair 1 wall | 300872.02-C6-30A2 | | |
| | N | 7th floor; common area; mech/elect room C08 | 300872.02-C7-15A | | |
| | N | 8th floor; common area; mech/elect room C08 | 300872.02-C8-15A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Gray concrete wall | N | Unit 104; laundry room above ceiling | 300872.02-104-22A | N | G |
| | N | Unit 201; laundry room above ceiling | 300872.02-201-22A | | |
| | N | Unit 403; laundry room above ceiling | 300872.02-403-19A | | |
| | N | Unit 502; laundry room above ceiling | 300872.02-502-37A | | |
| | N | | 300872.02-502-38A | | |
| | N | Unit 908; laundry room above ceiling | 300872.02-908-18A | | |
| | N | Exterior wall of the tower; Area B | 300872.02-C1-35A | | |
| | N | Exterior wall of the tower; Area D | 300872.02-C1-36A | | |
| | N | Exterior wall of the tower; Area A | 300872.02-C1-37A | | |
| Beige interior texture wall coating with gray cementitious coating | N | 1st floor; common area; hallway adjacent to janitor closet | 300872.02-C1-16A | N | G |
| | N | 1st floor; common area; hallway adjacent to stair 1 | 300872.02-C1-17A | | |
| | N | 1st floor; common area; stair 1 wall sidings | 300872.02-C1-18A2 | | |
| | N | 1st floor; common area; mech/elect room L07 wall sidings | 300872.02-C1-19A | | |
| | N | 1st floor; common area; stair 1 wall sidings | 300872.02-C1-19A2 | | |
| | N | 3rd floor; common area; mech/elect room C08 wall sidings | 300872.02-C3-16A | | |
| | N | 3rd floor; common area; stair 1 wall sidings | 300872.02-C3-16A2 | | |
| | N | 6th floor; common area; mech/elect room C08 wall sidings | 300872.02-C6-31A | | |
| | N | 6th floor; common area; mech/elect room C08 wall sidings | 300872.02-C6-32A | | |
| | N | 6th floor; common area; stair 1 wall sidings | 300872.02-C6-32A2 | | |
| | N | 7th floor; common area; mech/elect room C08 wall sidings | 300872.02-C7-16A | | |
| | N | 8th floor; common area; mech/elect room C08 wall sidings | 300872.02-C8-16A | | |
| 4”x4” pink ceramic wall tile with grout, mortar, and black mastic | N | Unit 104; hallway restroom; shower knob | 300872.02-104-14A | N | G |
| | N | Unit 201; hallway restroom; shower knob | 300872.02-201-15A | | |
| | N | Unit 201; master bedroom restroom; shower knob | 300872.02-201-16A | | |
| | N | Unit 403; hallway restroom; shower knob | 300872.02-403-14A | | |
| | N | Unit 502; hallway restroom; shower knob | 300872.02-502-29A | | |
| | N | | 300872.02-502-30A | | |
| | N | Unit 908; hallway restroom; shower knob | 300872.02-908-14A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| 4"x4" light-blue ceramic wall tile and grout over mortar | N | 1st floor; common area; trash storage L10 wall | 300872.02-C1-21A | N | G |
| | N | | 300872.02-C1-22A | | |
| Gray concrete ceiling with coating | N | Unit 104; kitchen above ceiling | 300872.02-104-20A | N | G |
| | N | Unit 201; laundry room above ceiling | 300872.02-201-19A | | |
| | N | Unit 403; laundry room above ceiling | 300872.02-403-17A | | |
| | N | Unit 502; laundry room above ceiling | 300872.02-502-33A | | |
| | N | | 300872.02-502-34A | | |
| | N | Unit 908; laundry room above ceiling | 300872.02-908-17A | | |
| Gray concrete with coating ceiling | N | 3rd floor; common area; hallway above ceiling | 300872.02-C3-14A | N | G |
| | N | 6th floor; common area; hallway above ceiling | 300872.02-C6-27A | | |
| | N | 6th floor; common area; hallway above ceiling | 300872.02-C6-28A | | |
| | N | 7th floor; common area; hallway above ceiling | 300872.02-C7-14A | | |
| | N | 8th floor; common area; hallway above ceiling | 300872.02-C8-14A | | |
| 2'x2' pinhole design ceiling tile | N | 1st floor; common area; hallway EBS L10C | 300872.02-C1-04A | Y | G |
| | N | 3rd floor; common area; hallway EBS C10G | 300872.02-C3-05A | | |
| | N | 6th floor; common area; hallway EBS C10G | 300872.02-C6-09A | | |
| | N | 6th floor; common area; hallway EBS C10G | 300872.02-C6-10A | | |
| | N | 7th floor; common area; hallway EBS C10G | 300872.02-C7-05A | | |
| | N | 8th floor; common area; hallway EBS C10G | 300872.02-C8-05A | | |
| Gray sprayed-on fireproof over gray coating | N | 1st floor; common area; electrical room L17 wall and ceiling | 300872.02-C1-23A | Y | G |
| | N | 1st floor; common area; mechanical room L18 wall and ceiling | 300872.02-C1-24A | | |
| Black sink mastic | N | Unit 104; kitchen sink undercoat | 300872.02-104-08A | N | G |
| | N | Unit 201; kitchen sink undercoat | 300872.02-201-08A | | |
| | N | Unit 403; kitchen sink undercoat | 300872.02-403-08A | | |
| | N | Unit 502; kitchen sink undercoat | 300872.02-502-17A | | |
| | N | | 300872.02-502-18A | | |
| | N | Unit 908; kitchen sink undercoat | 300872.02-908-08A | | |
| Silver/paper wrap with yellow fiberglass insulation | N | Unit 104; kitchen under sink cabinet | 300872.02-104-09A | Y | G |
| | N | Unit 201; kitchen under sink cabinet | 300872.02-201-09A | | |
| | N | Unit 403; kitchen under sink cabinet | 300872.02-403-09A | | |
| | N | Unit 502; kitchen under sink cabinet | 300872.02-502-19A | | |
| | N | | 300872.02-502-20A | | |
| | N | Unit 908; kitchen under sink cabinet | 300872.02-908-09A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Black felt with yellow fiberglass insulation | N | Unit 104; dining AC unit cover plate filter lining | 300872.02-104-18A | Y | G |
| | N | Unit 104; living AC unit cover plate filter lining | 300872.02-104-19A | | |
| Silver cloth wrap brown fiberglass insulation | N | Unit 104; kitchen fume hood exhaust | 300872.02-104-23A | Y | G |
| | N | Unit 908; kitchen fume hood exhaust | 300872.02-908-16A | | |
| Silver foil wrap with yellow fiberglass insulation | N | 1st floor; common area; pipe chase L05 | 300872.02-C1-09A | Y | G |
| | N | 3rd floor; common area; pipe chase C02 | 300872.02-C3-10A | | |
| Beige cloth wrap with silver foil and yellow fiberglass insulation | N | 1st floor, common area; mechanical room L18; pipe insulation | 300872.02-C1-25A | Y | G |
| | N | | 300872.02-C1-26A | | |
| Silver foil with paper wrap and yellow fiberglass insulation | N | 1st floor, common area; mechanical room L18; 8" diameter pipe insulation | 300872.02-C1-27A | Y | G |
| | N | | 300872.02-C1-28A | | |
| | N | 6th floor; common area; pipe chase C04 pipe elbow | 300872.02-C6-19A | | |
| | N | 6th floor; common area; pipe chase C04 pipe run | 300872.02-C6-20A | | |
| | N | 7th floor; common area; pipe chase C04 pipe run | 300872.02-C7-10A | | |
| | N | 8th floor; common area; pipe chase C04 pipe run | 300872.02-C8-10A | | |
| Silver paper foil wrap with yellow fiberglass pipe insulations | N | Roof; mechanical room P01 | 300872.02-R-08A | Y | G |
| Silver painted tan AC duct joint gasket | N | 3rd floor; common area; storage C07 AC duct | 300872.02-C3-13A | N | G |
| | N | 6th floor; common area; storage C07 AC duct | 300872.02-C6-25A | | |
| | N | 6th floor; common area; storage C07 AC duct | 300872.02-C6-26A | | |
| | N | 7th floor; common area; storage C07 AC duct | 300872.02-C7-13A | | |
| | N | 8th floor; common area; storage C07 AC duct | 300872.02-C8-13A | | |
| Black flange gasket | N | 1st floor; common area; pipe chase L05 | 300872.02-C1-12A | N | G |
| | N | | 300872.02-C1-13A | | |
| | N | 1st floor, common area; mechanical room L18; motor | 300872.02-C1-30A | | |
| | N | | 300872.02-C1-31A | | |
| Green flange gasket | N | 1st floor; common area; pipe chase L05 | 300872.02-C1-14A | N | G |
| | N | | 300872.02-C1-15A | | |
| Silver painted yellow AC duct joint gasket | N | Roof; mechanical P01 | 300872.02-R-09A | N | G |
| | N | | 300872.02-R-10A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 1: ASBESTOS SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| Tan gasket | N | 1st floor; common area; storage room L09; fire suppression pipe | 300872.02-C1-20A | N | G |
| | N | 3rd floor; common area; storage C07 fire suppression pipe | 300872.02-C3-09A | | |
| | N | 6th floor; common area; storage C09 fire suppression pipe | 300872.02-C6-17A | | |
| | N | 6th floor; common area; storage C09 fire suppression pipe | 300872.02-C6-18A | | |
| | N | 7th floor; common area; storage C09 fire suppression pipe | 300872.02-C7-09A | | |
| | N | 8th floor; common area; storage C09 fire suppression pipe | 300872.02-C8-09A | | |
| | N | Roof; storage P03 | 300872.02-R-06A | | |
| Silver cloth vibration dampener | N | 1st floor, common area; mechanical room L18; AC duct | 300872.02-C1-29A | N | G |
| Gray felt over cloth mesh with black tar over concrete coating | N | Roof | 300872.02-R-02A | N | G |
| | N | | 300872.02-R-03A | | |
| | N | | 300872.02-R-04A | | |
| | N | | 300872.02-R-05A | | |
| Beige roof tile grout | N | Lower roof; adjacent to unit 201; between clay roof tile | 300872.02-R-15A | N | G |
| | N | | 300872.02-R-16A | | |

*1. ACM=>0.1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 2: ASBESTOS SAMPLE SUMMARY MULTI-PURPOSE ROOM COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Homogenous Material | ACM[1] (Y/N) | Sampling Location | Sample ID | Friable (Y/N) | Condition[2] |
|---|---|---|---|---|---|
| 12”x12” beige with gray streaks vinyl floor tile over tan floor tile and tan mastic/ gray concrete coating | N | Community room L15 floor | 300872.02-MP-01A | N | G |
| | N | | 300872.02-MP-02A | | G |
| Gray concrete | N | Storage room L16 entry steps floor | 300872.02-MP-25A | N | G |
| | N | | 300872.02-MP-26A | | G |
| Gray concrete coating | N | Storage room L14 ceiling | 300872.02-MP-27A | N | G |
| | N | | 300872.02-MP-28A | | G |
| Concrete floor topping | N | Storage L12 floor | 300872.02-MP-13A | N | G |
| | N | Storage L16 floor | 300872.02-MP-14A | | G |
| Brown vinyl cove base with tan mastic | N | Community room L15 cove base | 300872.02-MP-03A | N | G |
| | N | | 300872.02-MP-04A | | G |
| Drywall and joint compound | N | Community room L15 wall | 300872.02-MP-05A | N | G |
| | N | Storage room L16 wall | 300872.02-MP-06A | | G |
| Gray door caulking | N | Exterior door | 300872.02-MP-07A | N | G |
| | N | | 300872.02-MP-08A | | G |
| Beige painted gray window caulking | N | Community room L15 interior window | 300872.02-MP-09A | N | G |
| | N | Storage room L16 interior window | 300872.02-MP-10A | | G |
| Beige texture coating and gray window caulking | N | Exterior window | 300872.02-MP-11A | N | G |
| | N | | 300872.02-MP-12A | | G |
| 2”x2” pinhole design ceiling tile | N | Community room L15 ceiling | 300872.02-MP-15A | Y | G |
| | N | | 300872.02-MP-16A | | G |
| Beige textured paint and gray cementitious material | N | Exterior wall | 300872.02-MP-17A | N | G |
| | N | | 300872.02-MP-18A | | G |
| Silver cloth vibration dampener | N | Storage room L14 AC duct dampener | 300872.02-MP-19A | N | G |
| | N | | 300872.02-MP-20A | | G |
| Tan gasket | N | Storage room L16 fire suppression pipe | 300872.02-MP-21A | N | G |
| | N | | 300872.02-MP-22A | | G |
| Silver and yellow painted black AC duct joint sealant | N | Storage room L14 AC duct | 300872.02-MP-23A | N | G |
| | N | | 300872.02-MP-24A | | G |
| Silver paper foil wrap with yellow fiberglass insulation | N | Storage room L12 pipe insulation | 300872.02-MP-29A | Y | G |
| | N | | 300872.02-MP-30A | | G |

*1. ACM=>1% asbestos content*
*2. Good (G); Damaged (D) <10% distributed or 25% localized; Significant Damage (SD), >10% distributed or 25% localized*

**TABLE 3: LEAD, CADMIUM, AND CHROMIUM PAINT SAMPLE SUMMARY**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Paint Color | Int/Ext | LBP[1] (Y/N) | Cd (Y/N) | Cr (Y/N) | Sample Location | Sample ID | Condition[2,3] |
|---|---|---|---|---|---|---|---|
| **Beige over brown** | **Int** | **Y** | N | Y | **Metal doorframe**<br>**5th floor; unit 502 entry door** | **300872.02-502-01P** | **Intact** |
| Brown | Int | N | N | Y | Metal door<br>5th floor; unit 502 entry door | 300872.02-502-02P | Intact |
| Beige | Int | N | N | N | Wood doorframe<br>5th floor; unit 502 kitchen | 300872.02-502-03P | Intact |
| | Int | N | N | N | Wood door<br>5th floor; unit 502 kitchen | 300872.02-502-04P | Intact |
| Off-white | Int | N | N | N | Drywall<br>5th floor; unit 502; bedroom 3 closet wall | 300872.02-502-05P | Intact |
| | Int | N | N | N | Gypsum board ceiling<br>5th floor; unit 502 kitchen | 300872.02-502-06P | Intact |
| | Int | N | N | N | Concrete wall<br>5th floor; unit 502 hall | 300872.02-502-07P | Intact |
| Glaze pink | Int | N | N | N | Ceramic wall tile<br>5th floor; unit 502 restroom wall | 300872.02-502-08P | Intact |
| Glazed gray | Int | N | N | N | Ceramic floor tile<br>5th floor; unit 502 restroom floor | 300872.02-502-09P | Intact |
| Beige | Ext | N | N | N | Concrete wall<br>5th floor; unit 502 balcony | 300872.02-502-10P | Intact |
| Brown | Ext | N | N | N | Concrete wall<br>5th floor; unit 502 balcony parapet wall | 300872.02-502-11P | Intact |
| **Beige over yellow** | **Int** | **Y** | N | Y | **Metal door and frame**<br>**5th floor; unit 502 balcony/stair exit door** | **300872.02-502-12P** | **Intact** |
| Brown | Int | N | N | N | Concrete floor<br>5th floor; unit 502 balcony floor | 300872.02-502-13P | Fair |
| Red | Int | N | N | N | Ceramic floor<br>1st floor; common area hallway floor | 300872.02-C1-01P | Intact |
| Glazed light blue | Int | N | N | N | Ceramic wall<br>1st floor; common area; garbage storage wall | 300872.02-C1-02P | Intact |
| Brown over beige | Int | N | N | Y | Concrete baseboard<br>1st floor; common area; hallway | 300872.02-C1-03P | Intact |

*1. LBP = >0.5% lead by weight*
*2. Exterior: Intact – Entire surface is intact; Fair - ≤ 10ft$^2$; Poor - >10 ft$^2$*
*3. Interior: Intact – Entire surface is intact; Fair - ≤ 2ft$^2$ or ≤ 10%; Poor - >2 ft$^2$ or >10%*

**TABLE 3: LEAD, CADMIUM, AND CHROMIUM PAINT SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Paint Color | Int/Ext | LBP[1] (Y/N) | Cd (Y/N) | Cr (Y/N) | Paint Sample Location | Sample ID | Condition[2,3] |
|---|---|---|---|---|---|---|---|
| Beige | Int | N | N | N | Concrete wall<br>1st floor; common area; room EBS L10B | 300872.02-C1-04P | Intact |
| Brown over beige | Int | N | N | N | Drywall<br>1st floor; common area; room EBS L10B wall | 300872.02-C1-05P | Intact |
| Black | Int | N | N | N | Metal motor pump base frame<br>1st floor; common area; mechanical room L18 | 300872.02-C1-06P | Intact |
| Silver over yellow | Int | N | Y | Y | Metal AC duct<br>1st floor; common area; mechanical room L18 | 300872.02-C1-07P | Intact |
| Beige over black | Int | N | N | N | Metal pipe<br>1st floor; common area; mechanical room L18 | 300872.02-C1-08P | Intact |
| Gray | Int | N | N | Y | Metal support frame<br>1st floor; common area; mechanical room L18 | 300872.02-C1-09P | Intact |
| Blue | Int | N | N | N | Metal motor pump<br>1st floor; common area; mechanical room L18 | 300872.02-C1-10P | Intact |
| Green | Int | N | N | N | Metal pipe<br>1st floor; common area; mechanical room L18 | 300872.02-C1-11P | Intact |
| **Green over orange** | **Int** | **Y** | N | Y | **Metal stair railing**<br>**1st floor; common area; mechanical room L18** | **300872.02-C1-12P** | **Intact** |
| Red | Int | N | N | N | Metal fire alarm terminal cabinet<br>1st floor; common area; mechanical room L18 | 300872.02-C1-13P | Intact |
| Beige | Ext | N | N | N | PVC downspout<br>1st floor; common area; exterior of the building | 300872.02-C1-14P | Intact |
| **Light-brown over yellow** | **Int** | **Y** | N | N | **Metal doorframe**<br>**6th floor; common area; stair 1** | **300872.02-C6-01P** | **Intact** |
| **Tan over yellow** | **Int** | **Y** | N | Y | **Metal door**<br>**6th floor; common area; stair 1** | **300872.02-C6-02P** | **Intact** |
| Brown over beige | Int | N | N | Y | Concrete baseboard<br>6th floor; common area; stair 1 | 300872.02-C6-03P | Intact |
| **Green over orange** | **Int** | **Y** | N | Y | **Metal handrail/railing**<br>**6th floor; common area; stair 1** | **300872.02-C6-04P** | **Intact** |

*1. LBP = >0.5% lead by weight*
*2. Exterior: Intact – Entire surface is intact; Fair - ≤ 10ft$^2$; Poor - >10 ft$^2$*
*3. Interior: Intact – Entire surface is intact; Fair - ≤ 2ft$^2$ or ≤ 10%; Poor - >2 ft$^2$ or >10%*

**TABLE 3: LEAD, CADMIUM, AND CHROMIUM PAINT SAMPLE SUMMARY (CONTINUED)**
**COURTNEY TOWER 4511, CAMP COURTNEY, OKINAWA, JAPAN**

| Paint Color | Int/Ext | LBP[1] (Y/N) | Cd (Y/N) | Cr (Y/N) | Paint Sample Location | Sample ID | Condition[2,3] |
|---|---|---|---|---|---|---|---|
| Beige | Int | N | N | N | Concrete wall<br>6th floor; common area; stair 1 | 300872.02-C6-05P | Intact |
| Beige | Int | N | N | N | Drywall ceiling/soffit<br>6th floor; common area; hallway/room EBS C10 | 300872.02-C6-06P | Intact |
| Beige | Int | N | N | N | Drywall<br>6th floor; common area; room EBS C10 | 300872.02-C6-07P | Intact |
| **Red** | **Int** | **Y** | N | Y | **Metal fire suppression pipe**<br>**6th floor; common area; storage C09** | **300872.02-C6-08P** | **Intact** |
| Beige | Int | N | N | N | Metal conduit<br>6th floor; common area; storage C09 | 300872.02-C6-09P | Intact |
| Beige | Int | N | N | N | CMU wall<br>6th floor; common area; janitor's room | 300872.02-C6-10P | Intact |
| **Beige** | **Ext** | **Y** | Y | N | **Metal fence**<br>**Roof; perimeter fence and post** | **300872.02-R-01P** | **Intact** |
| Gray | Ext | N | N | N | Roof felt<br>Roof | 300872.02-R-02P | Fair |
| Gray over brown | Ext | N | N | N | Metal exhaust vent<br>Roof; AC exhaust vent | 300872.02-R-03P | Intact |
| Beige | Int | N | N | N | Concrete wall<br>Multi-purpose; community room L15 | 300872.02-MP-01P | Intact |
| | Int | N | N | N | Drywall<br>Multi-purpose; storage room L12 | 300872.02-MP-02P | Intact |
| | Int | N | N | N | Wood door and frame<br>Multi-purpose; storage room L12 | 300872.02-MP-03P | Intact |
| Beige over yellow | Int | N | Y | Y | Metal pipe<br>Multi-purpose; storage room L12 | 300872.02-MP-04P | Intact |
| Red | Int | N | N | N | Metal fire suppression pipe<br>Multi-purpose; storage room L16 | 300872.02-MP-05P | Intact |
| Beige | Ext | N | N | N | Concrete wall<br>Multi-purpose; exterior wall | 300872.02-MP-06P | Intact |

*1. LBP = >0.5% lead by weight*
*2. Exterior: Intact – Entire surface is intact; Fair - ≤ 10ft$^2$; Poor - >10 ft$^2$*
*3. Interior: Intact – Entire surface is intact; Fair - ≤ 2ft$^2$ or ≤ 10%; Poor - >2 ft$^2$ or >10%*

EnviroQuest

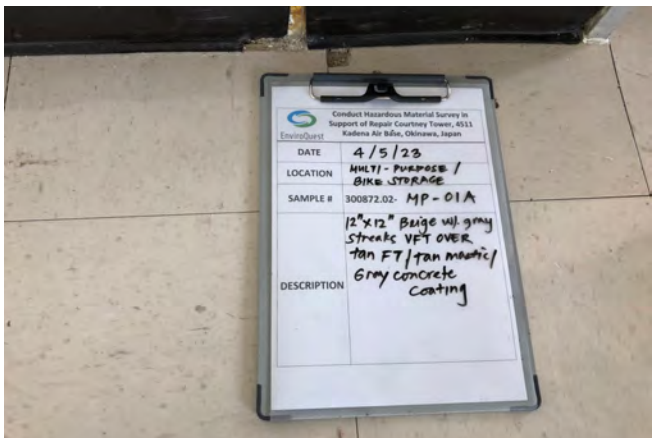
# APPENDIX A

## REFERENCE PHOTOGRAPHS

# REFERENCE PHOTOGRAPHS

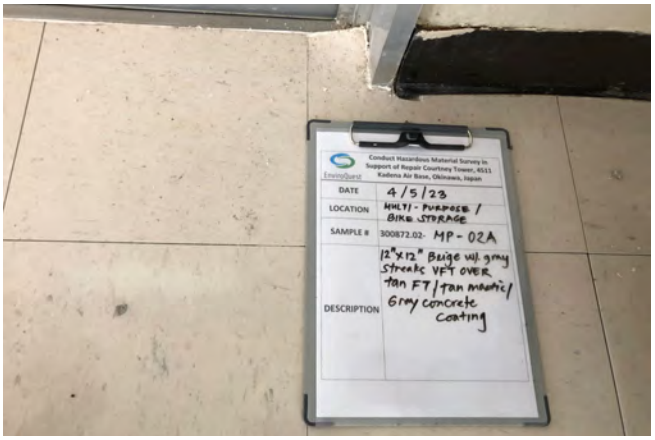
EnviroQuest

Tower 4511, Camp Courtney, Okinawa, Japan.



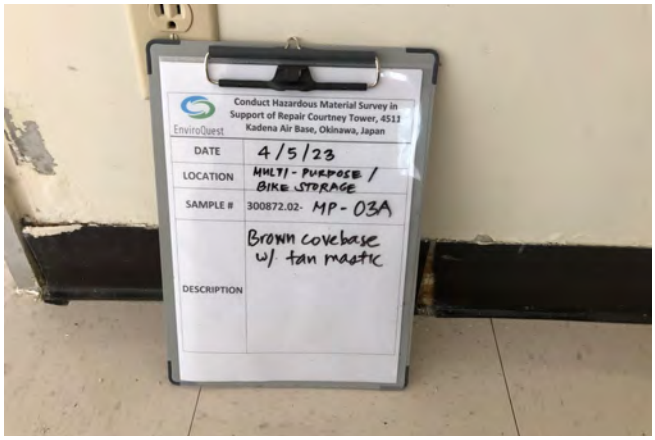

Multi Purpose Room/Bike Storage

Non asbestos containing 12”x12” beige with gray streaks vinyl floor tile over tan mastic and gray concrete coating



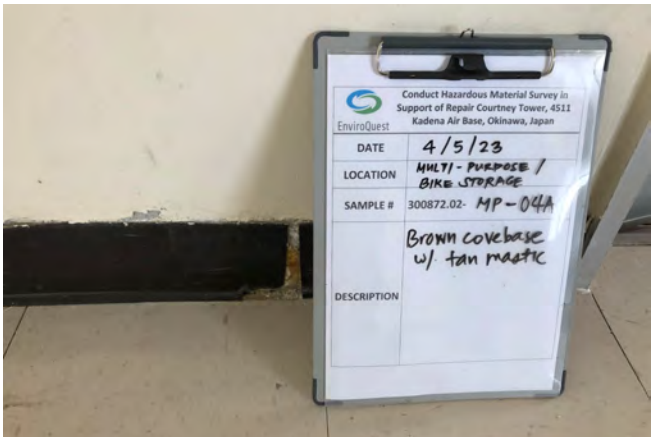

Multi Purpose Room/Bike Storage

Non asbestos containing 12”x12” beige with gray streaks vinyl floor tile over tan mastic and gray concrete coating




Multi Purpose Room/Bike Storage

Non asbestos containing brown covebase with tan mastic.




Multi Purpose Room/Bike Storage

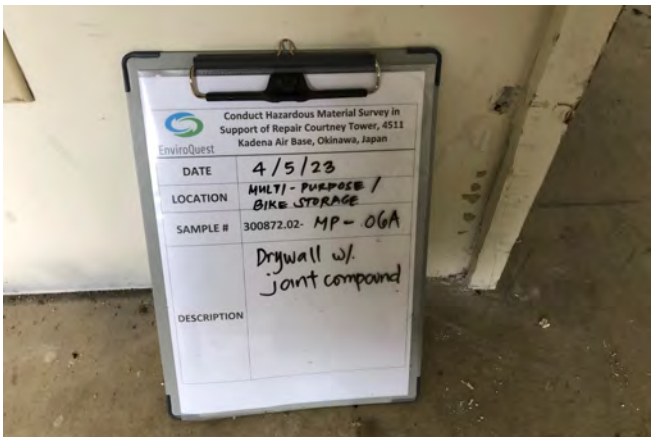
Non asbestos containing brown covebase with tan mastic.

Multi Purpose Room/Bike Storage

Non asbestos containing drywall with joint compound.

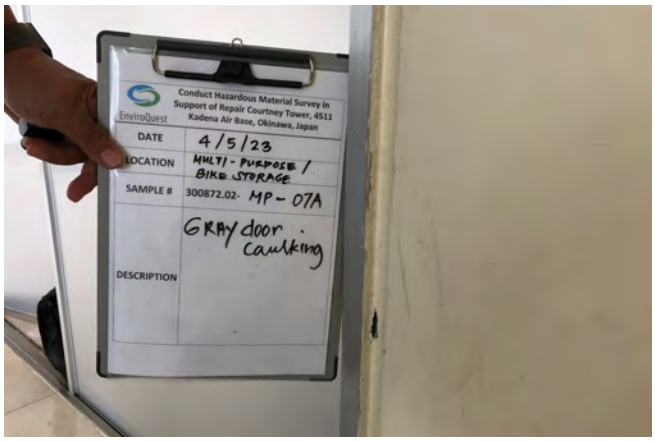
# REFERENCE PHOTOGRAPHS

EnviroQuest



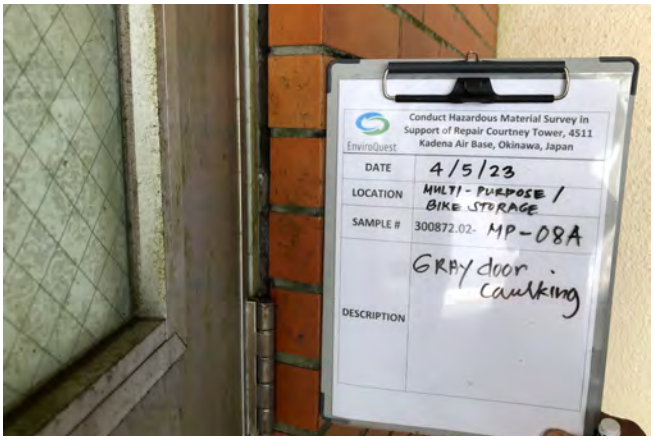

Multi Purpose Room/Bike Storage

Non asbestos containing drywall with joint compound.



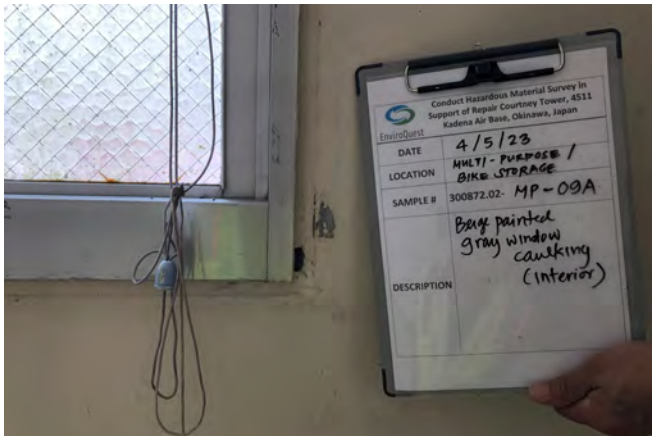

Multi Purpose Room/Bike Storage

Non asbestos containing gray door caulking.



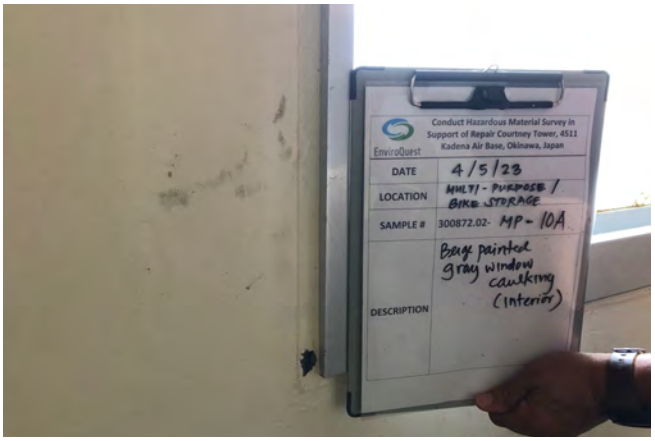

Multi Purpose Room/Bike Storage

Non asbestos containing gray door caulking.



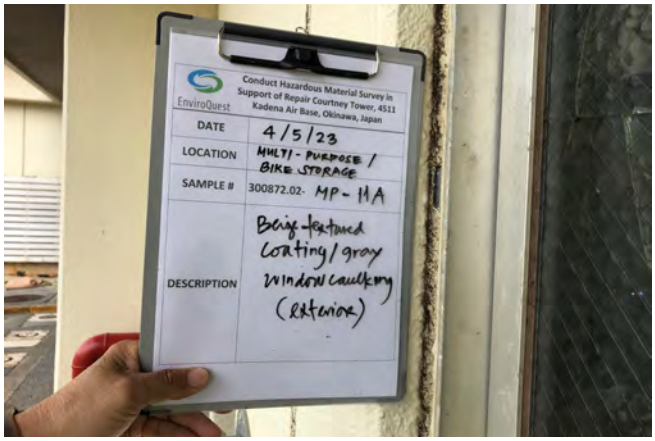

Multi Purpose Room/Bike Storage

Non asbestos containing beige painted gray window caulking.




Multi Purpose Room/Bike Storage

Non asbestos containing beige painted gray window caulking.

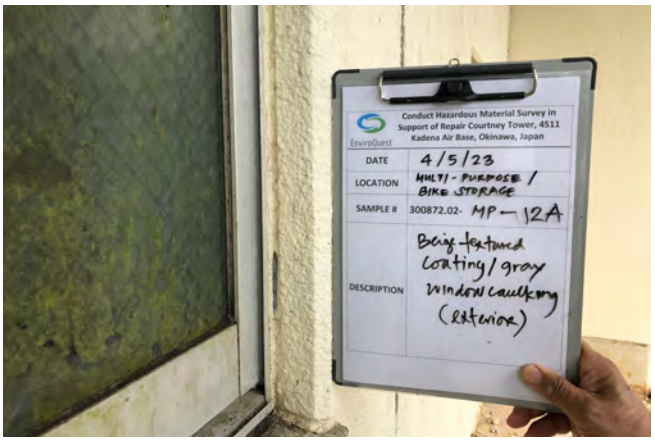



Multi Purpose Room/Bike Storage

Non asbestos containing beige textured coating with gray window caulking.

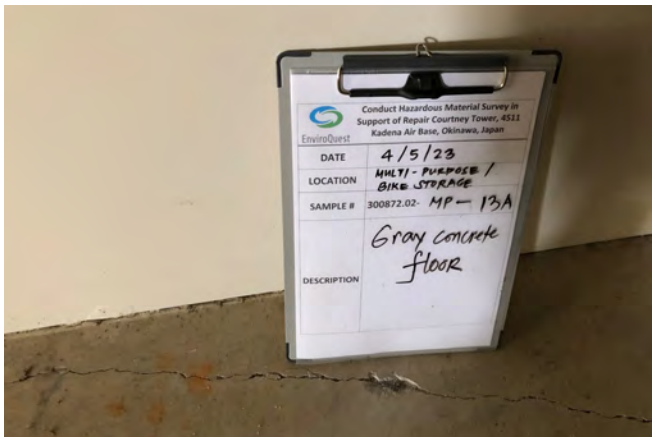
# REFERENCE PHOTOGRAPHS

EnviroQuest




Multi Purpose Room/Bike Storage

Non asbestos containing beige textured coating with gray window caulking.

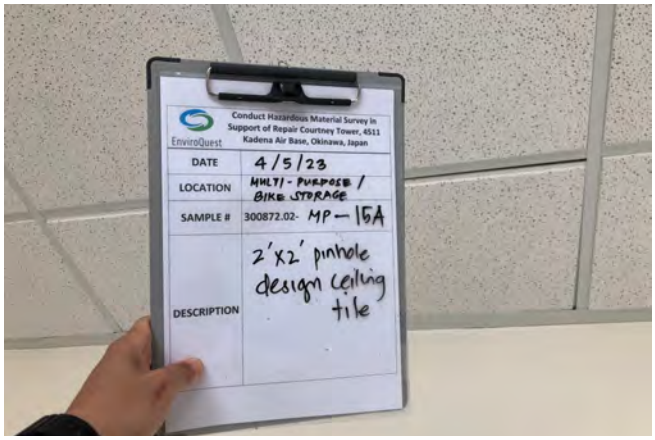



Multi Purpose Room/Bike Storage

Non asbestos containing gray concrete floor.

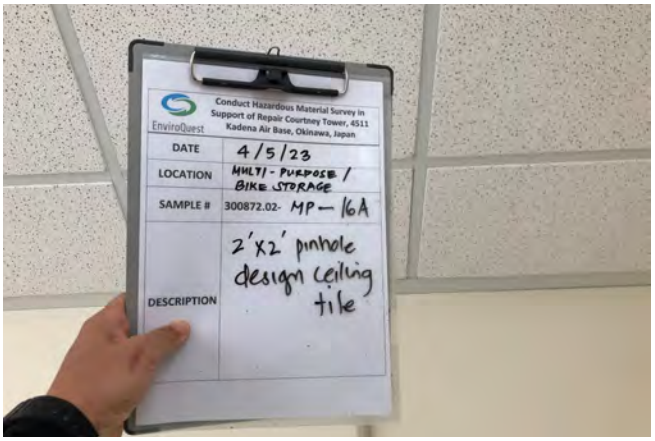
Multi Purpose Room/Bike Storage

Non asbestos containing gray concrete floor.




Multi Purpose Room/Bike Storage

Non asbestos containing 2'x2' pinhole design ceiling tile.




Multi Purpose Room/Bike Storage

Non asbestos containing 2'x2' pinhole design ceiling tile.

Multi Purpose Room/Bike Storage

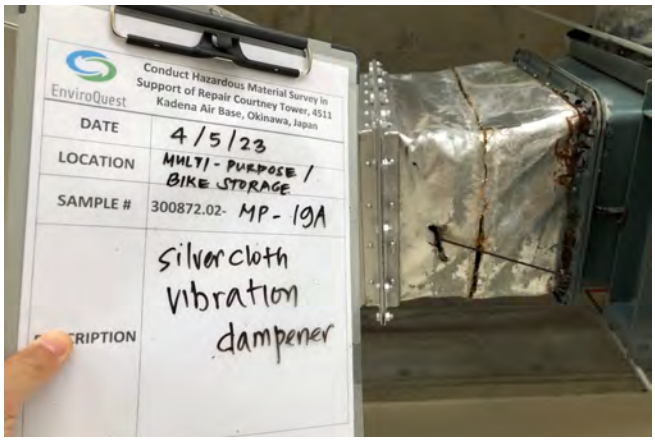
Non asbestos containing beige textured paint with gray cementitious material.

# REFERENCE PHOTOGRAPHS

EnviroQuest

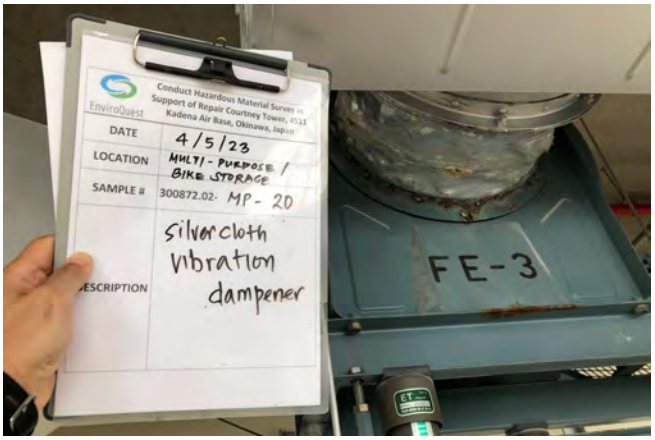
Multi Purpose Room/Bike Storage

Non asbestos containing beige textured paint with gray cementitious material.




Multi Purpose Room/Bike Storage

Non asbestos containing silver cloth vibration dampener.




Multi Purpose Room/Bike Storage

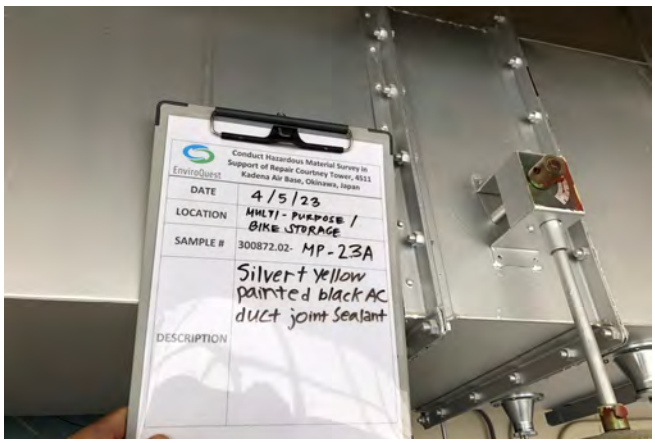
Non asbestos containing silver cloth vibration dampener.

Multi Purpose Room/Bike Storage

Non asbestos containing tan gasket.

Multi Purpose Room/Bike Storage

Non asbestos containing tan gasket.




Multi Purpose Room/Bike Storage

Non asbestos containing silver and yellow painted black AC duct joint sealant.

# REFERENCE PHOTOGRAPHS

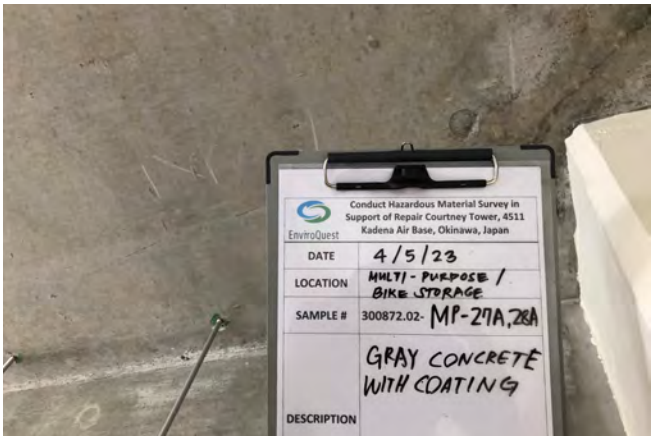
EnviroQuest

Multi Purpose Room/Bike Storage

Non asbestos containing silver and yellow painted black AC duct joint sealant.

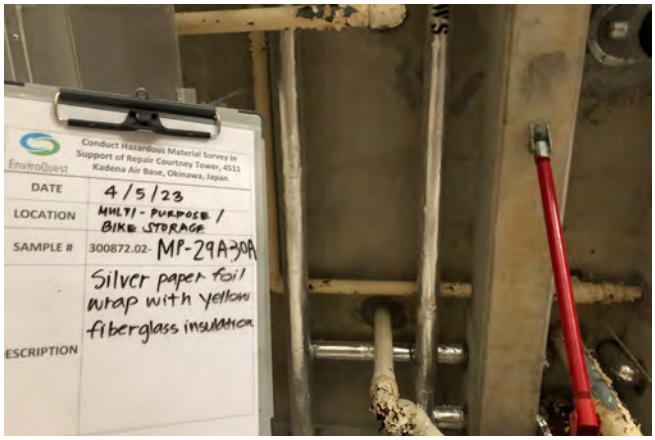
Multi Purpose Room/Bike Storage

Non asbestos containing gray concrete.



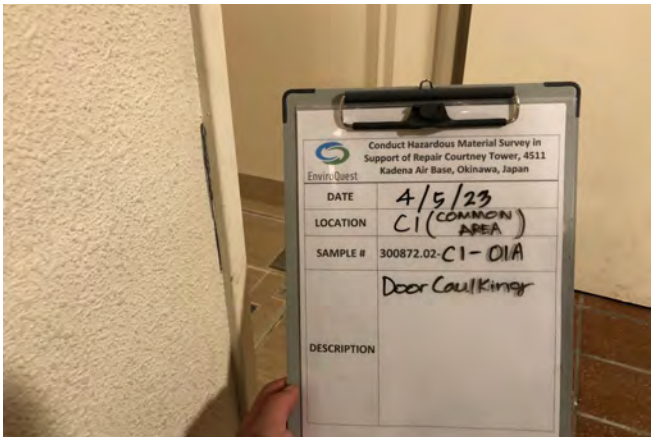

Multi Purpose Room/Bike Storage

Non asbestos containing gray concrete with coating.



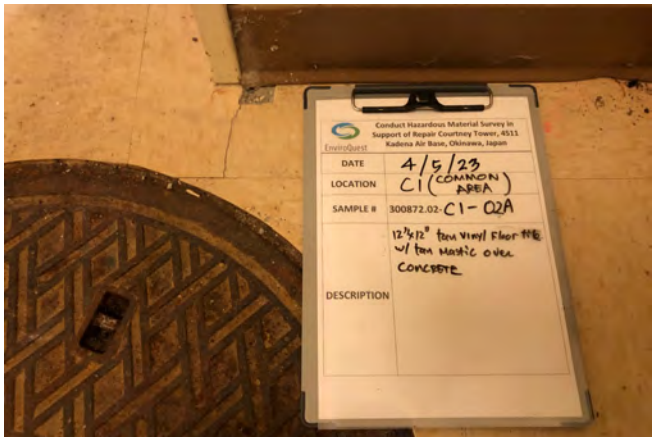

Multi Purpose Room/Bike Storage

Non asbestos containing silver paper foil wrap with yellow fiberglass insulation.




1st floor Common Area

Non asbestos containing door caulking.

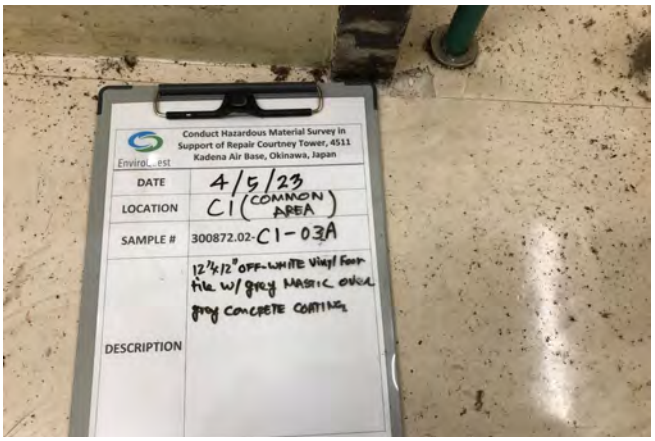



1st floor Common Area

Non asbestos containing 12”x12” tan vinyl floor tile with tan mastic over concrete.

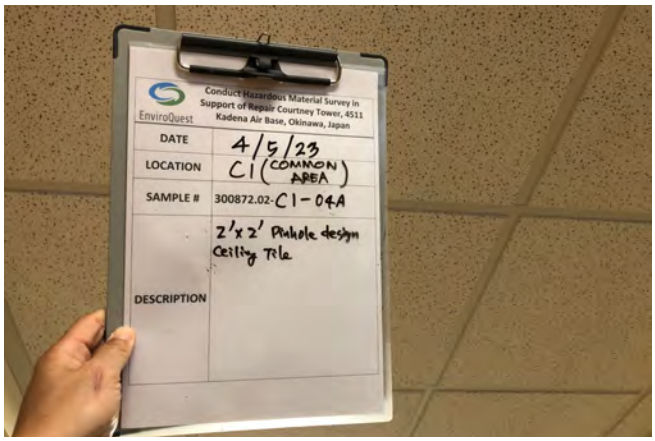
# REFERENCE PHOTOGRAPHS

EnviroQuest



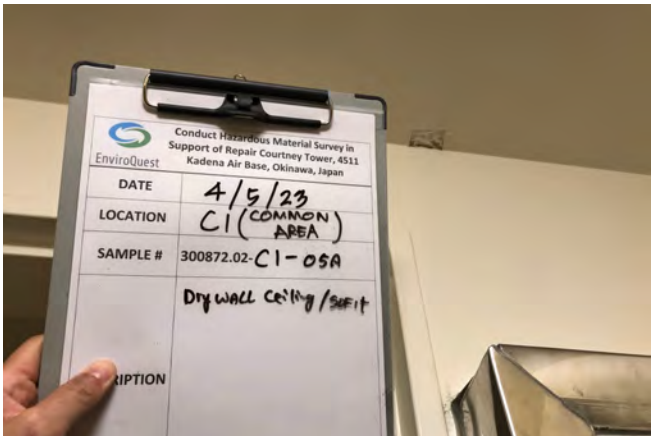

1st floor Common Area

Non asbestos containing 12”x12” off white vinyl floor tile with gray mastic over gray concrete coating.



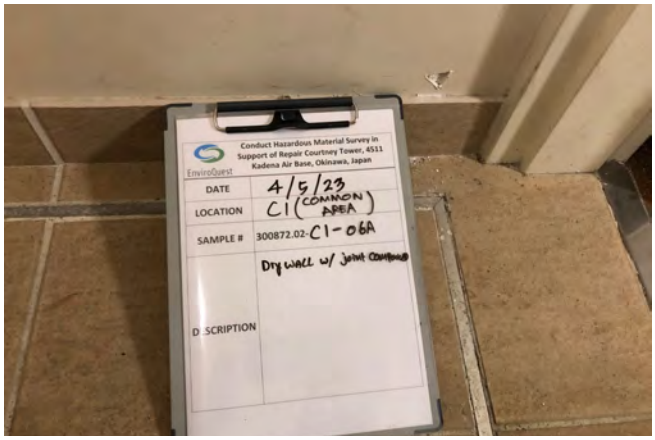

1st floor Common Area

Non asbestos containing 2’x2’ pinhole design ceiling tile.



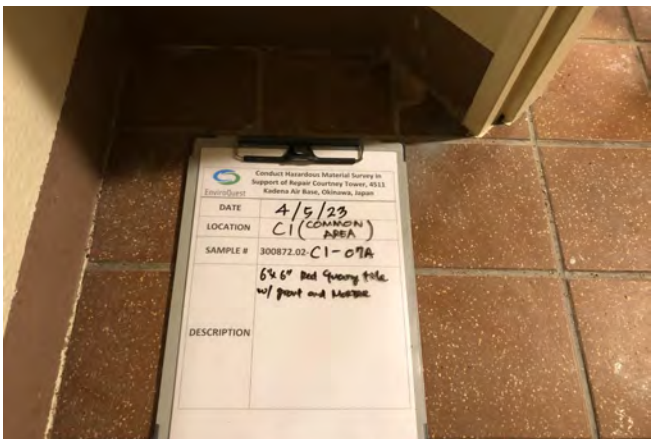

1st floor Common Area

Non asbestos containing drywall ceiling/soffit.




1st floor Common Area

Non asbestos containing drywall with joint compound.




1st floor Common Area

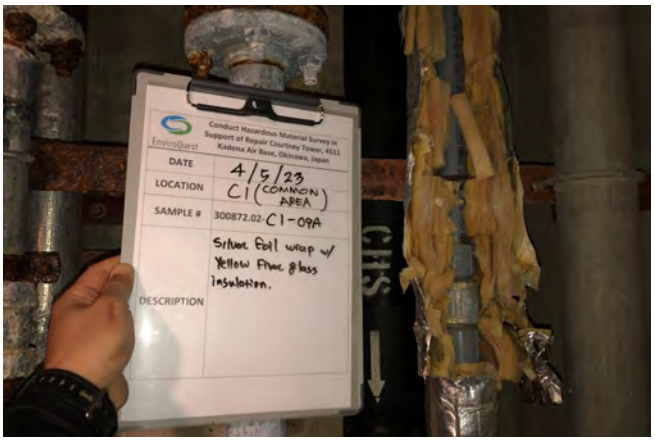
Non asbestos containing 6”x6” red quarry tile with grout and mortar.

1st floor Common Area

Non asbestos containing 6”x6” red quarry tile with grout and mortar.

# REFERENCE PHOTOGRAPHS

EnviroQuest

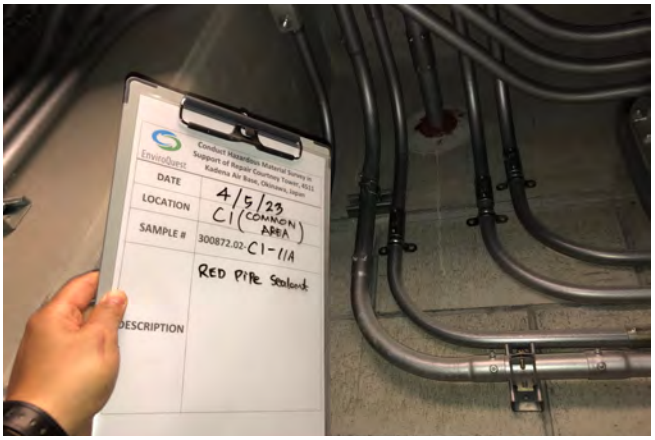



1st floor Common Area

Non asbestos containing silver foil wrap with yellow fiberglass insulation.

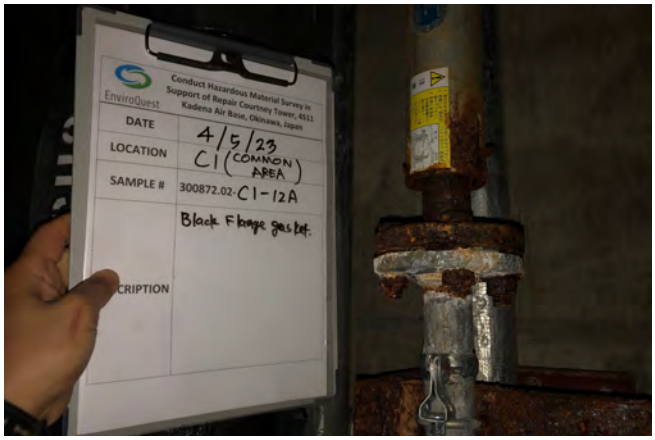
1st floor Common Area

Non asbestos containing silver painted black AC duct joint sealant.



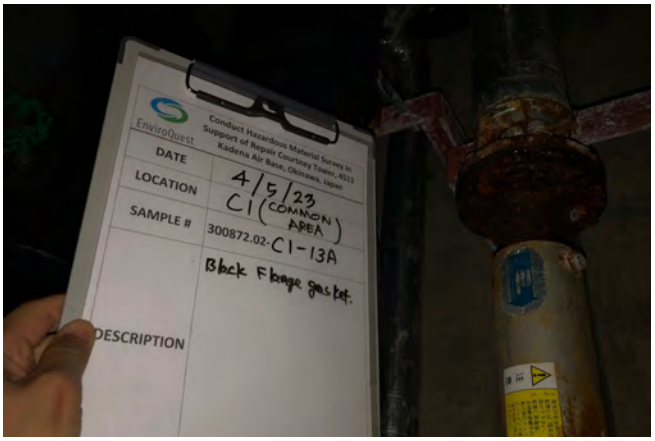

1st floor Common Area

Non asbestos containing red pipe sealant.




1st floor Common Area

Non asbestos containing black flange gasket.




1st floor Common Area

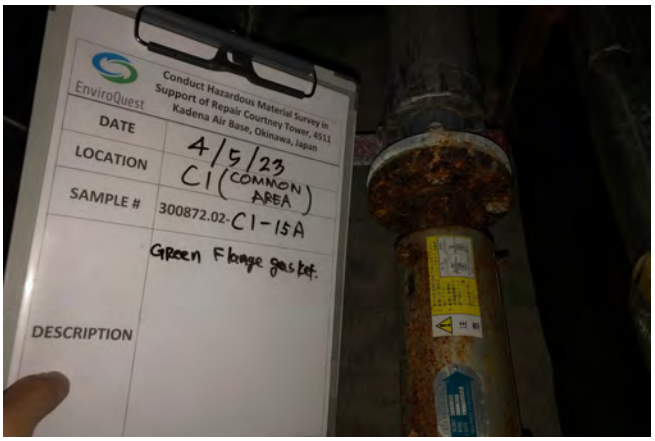
Non asbestos containing black flange gasket.

1st floor Common Area

Non asbestos containing green flange gasket.

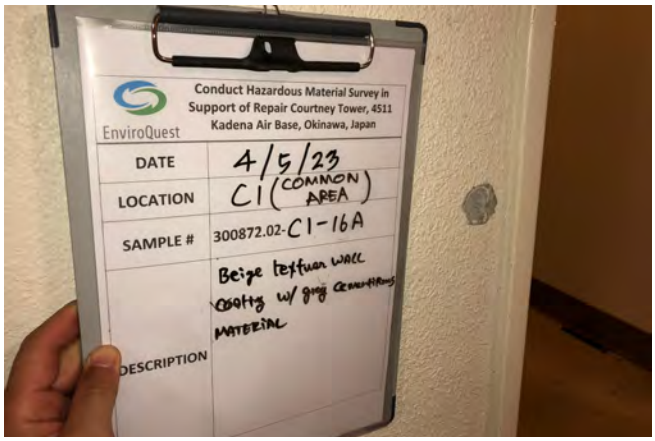
# REFERENCE PHOTOGRAPHS

EnviroQuest



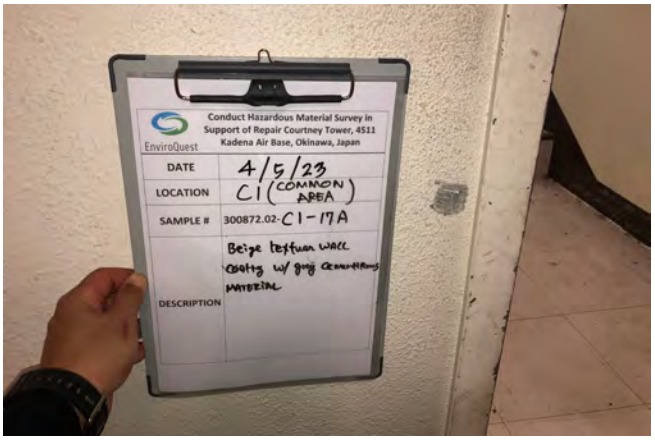

1st floor Common Area

Non asbestos containing green flange gasket.




1st floor Common Area

Non asbestos containing beige textured wall coating with gray cementitious material.

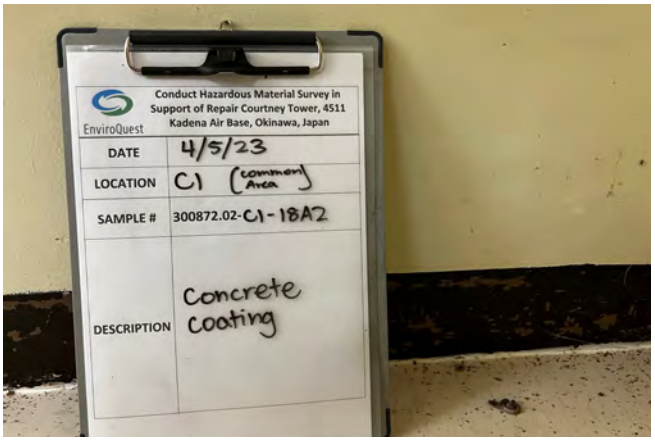



1st floor Common Area

Non asbestos containing beige textured wall coating with gray cementitious material.

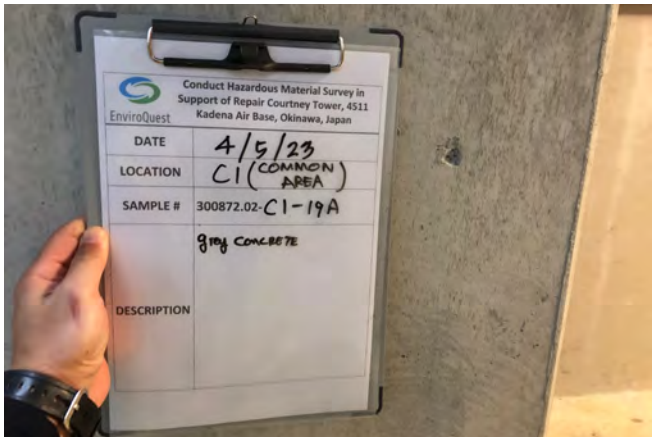
1st floor Common Area

Non asbestos containing gray textured coating.




1st floor Common Area

Non asbestos containing concrete coating.

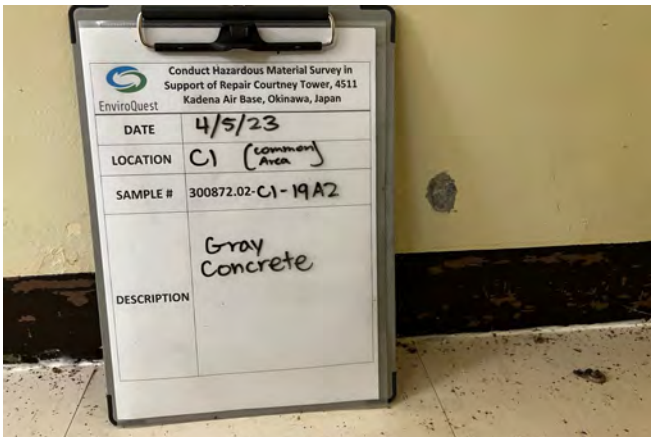



1st floor Common Area

Non asbestos containing gray concrete.

# REFERENCE PHOTOGRAPHS

EnviroQuest

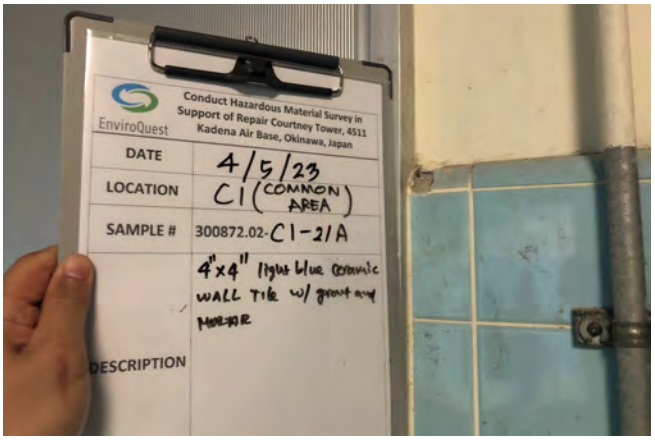



1st floor Common Area

Non asbestos containing gray concrete.

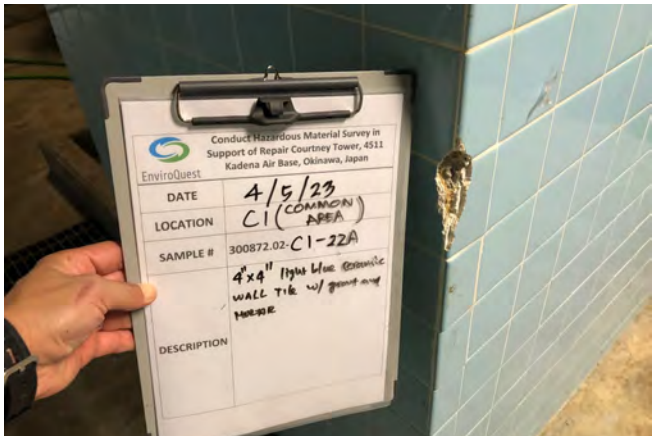
1st floor Common Area

Non asbestos containing tan gasket.



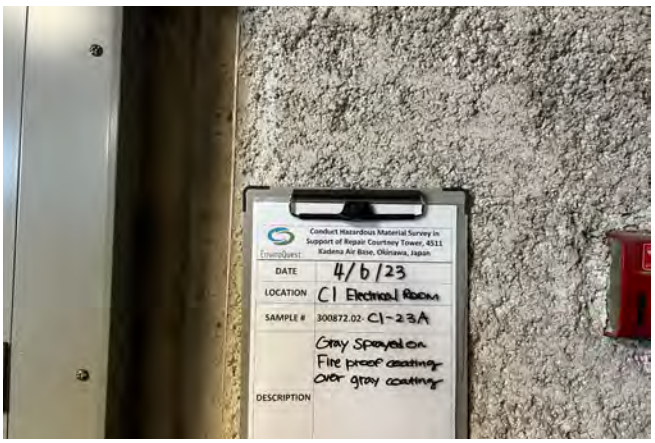

1st floor Common Area

Non asbestos containing 4”x4” light blue ceramic wall tile with grout and mortar.



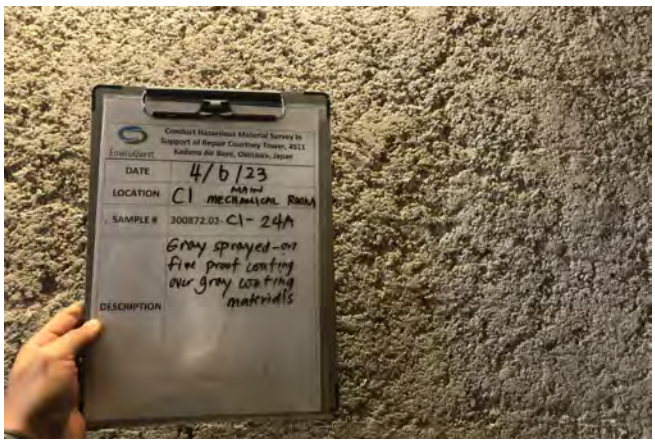

1st floor Common Area

Non asbestos containing 4”x4” light blue ceramic wall tile with grout and mortar.




1st floor Common Area Electrical Room

Non asbestos containing gray sprayed on fireproof coating over gray coating.

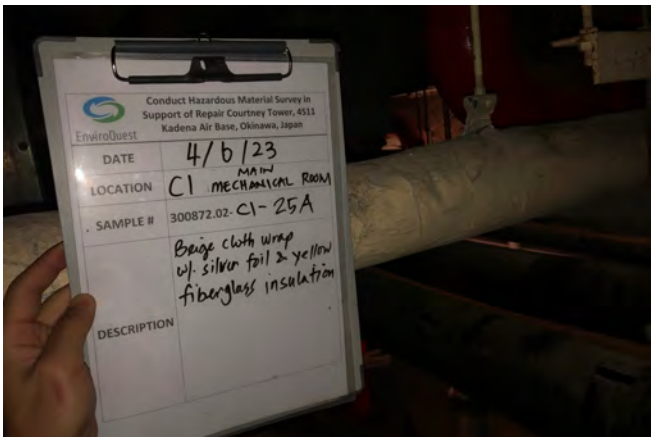



1st floor Common Area Main Mechanical Room

Non asbestos containing gray sprayed on fireproof coating over gray coating material.

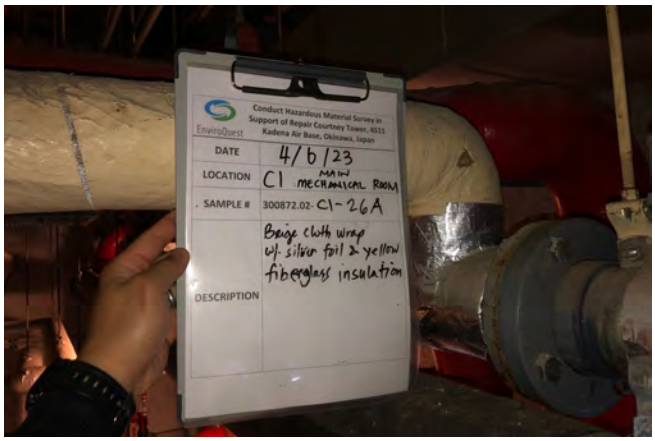
# REFERENCE PHOTOGRAPHS

EnviroQuest



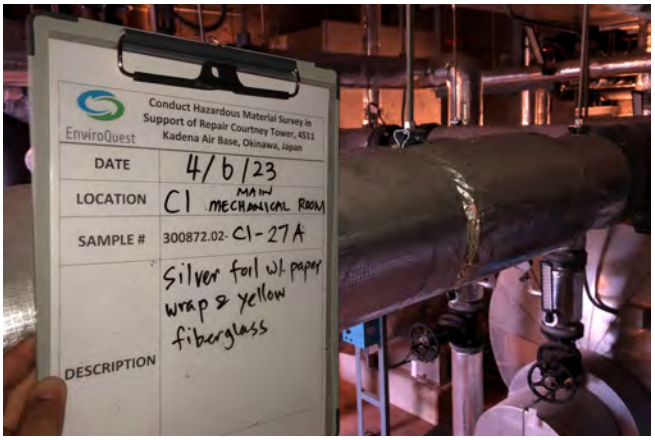

1st floor Common Area Main Mechanical Room

Non asbestos containing beige cloth wrap with silver foil and yellow fiberglass insulation.



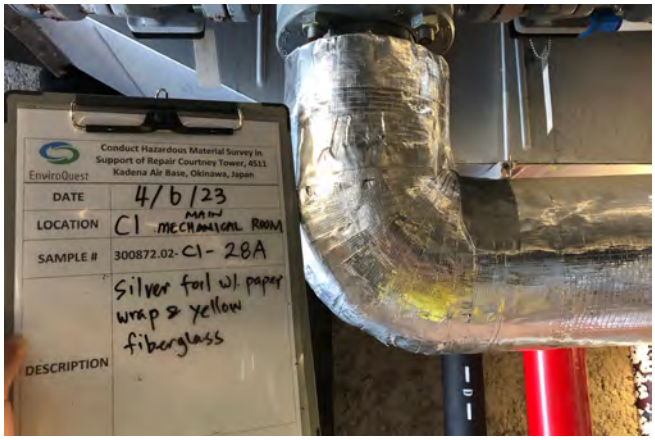

1st floor Common Area Main Mechanical Room

Non asbestos containing beige cloth wrap with silver foil and yellow fiberglass insulation.



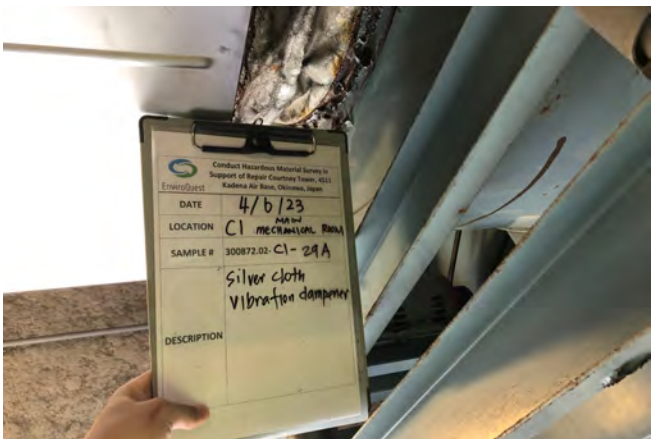

1st floor Common Area Main Mechanical Room

Non asbestos containing silver foil with paper wrap and yellow fiberglass.



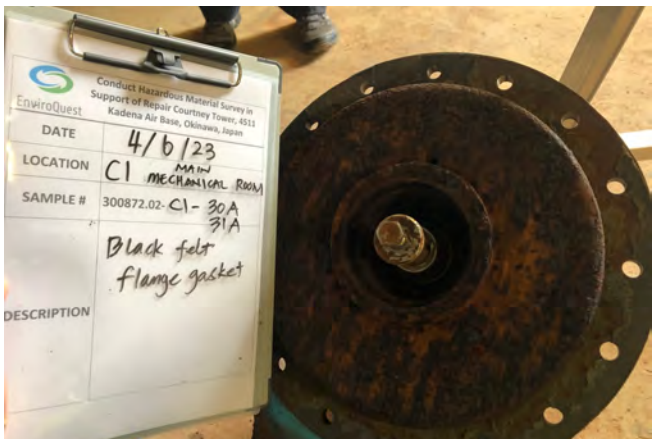

1st floor Common Area Main Mechanical Room

Non asbestos containing silver foil with paper wrap and yellow fiberglass.




1st floor Common Area Main Mechanical Room

Non asbestos containing silver cloth vibration dampener.

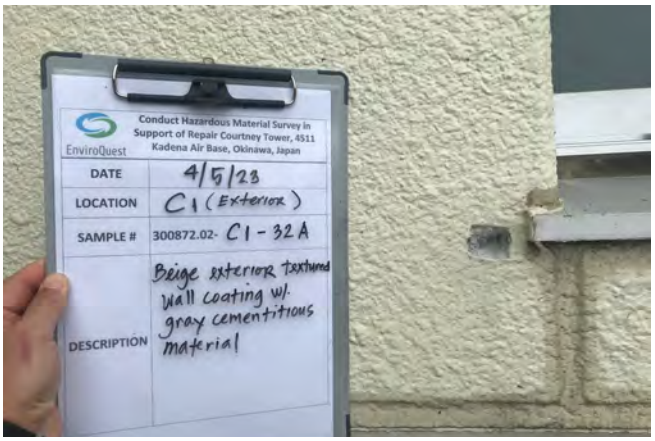



1st floor Common Area Main Mechanical Room

Non asbestos containing black felt flange gasket.

# REFERENCE PHOTOGRAPHS

EnviroQuest

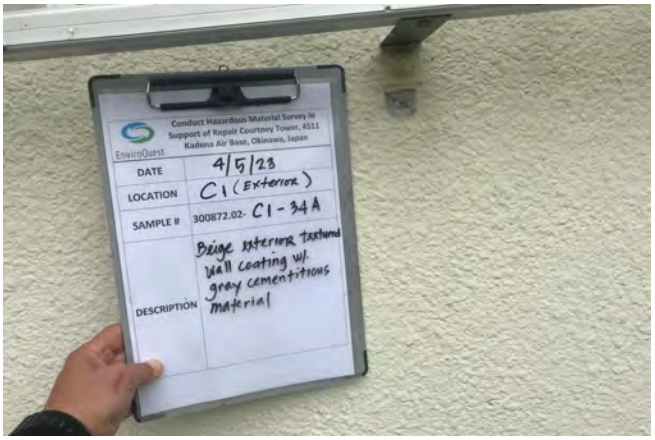



1st floor Common Area Exterior

Non asbestos containing beige exterior textured wall coating with gray cementitious material.

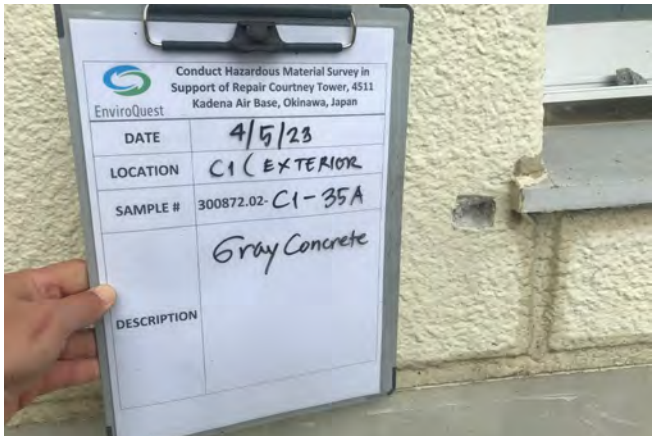
1st floor Common Area Exterior

Non asbestos containing beige exterior textured wall coating with gray cementitious material.




1st floor Common Area Exterior

Non asbestos containing beige exterior textured wall coating with gray cementitious material.




1st floor Common Area Exterior

Non asbestos containing gray concrete.

1st floor Common Area Exterior

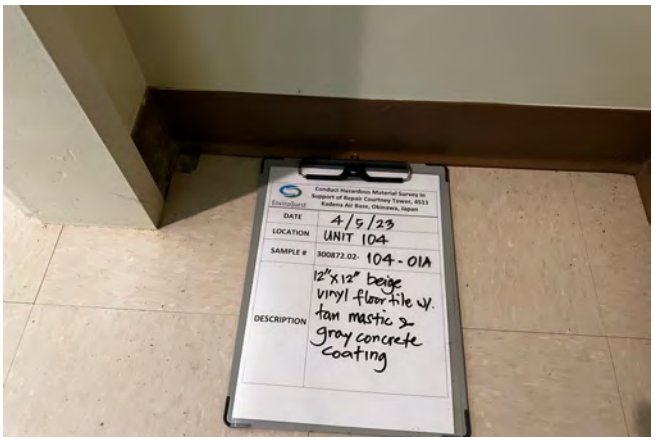
Non asbestos containing gray concrete.

1st floor Common Area Exterior

Non asbestos containing gray concrete.

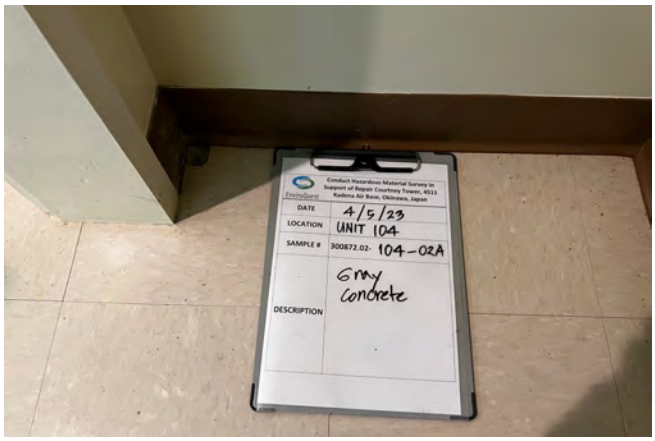
# REFERENCE PHOTOGRAPHS

EnviroQuest




Unit 104

Non asbestos containing 12”x12” beige vinyl floor tile with tan mastic and gray concrete coating.

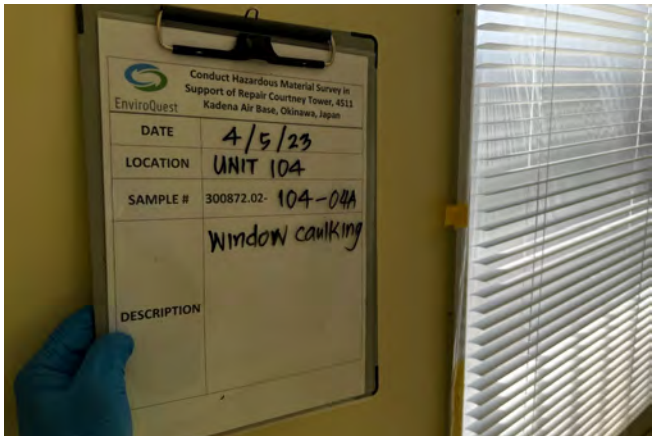



Unit 104

Non asbestos containing gray concrete.

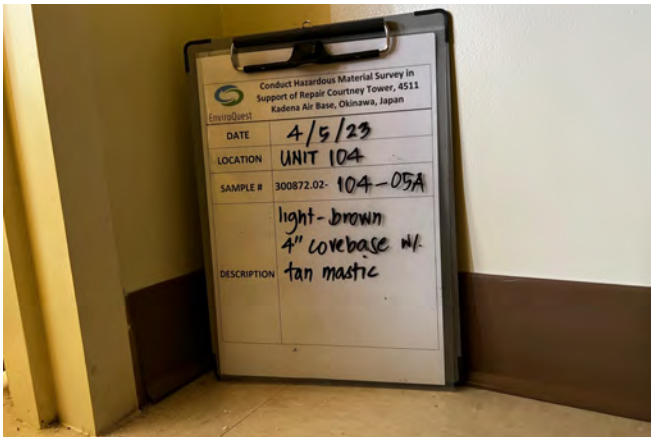
Unit 104

Non asbestos containing door caulking.



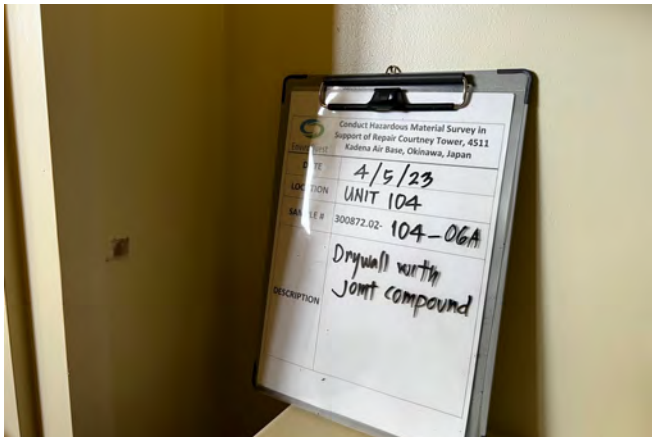

Unit 104

Non asbestos containing window caulking.




Unit 104

Non asbestos containing light brown 4” covebase with tan mastic.

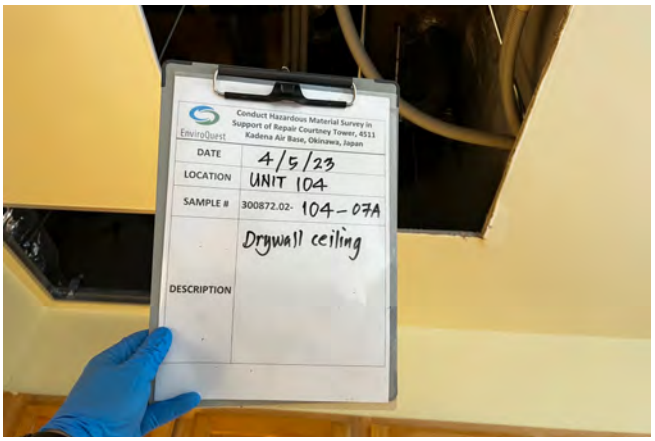



Unit 104

Non asbestos containing drywall with joint compound.

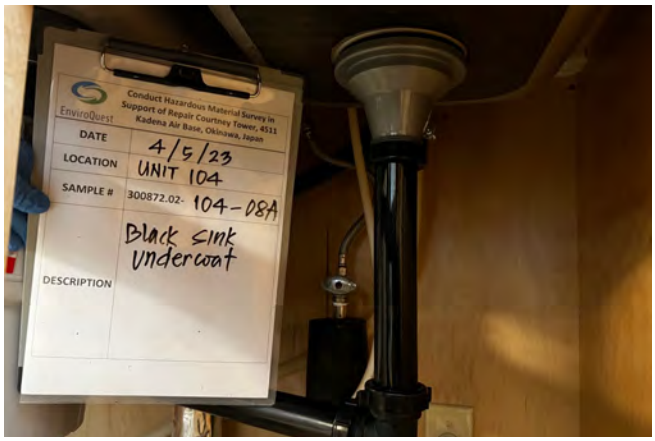
# REFERENCE PHOTOGRAPHS

EnviroQuest



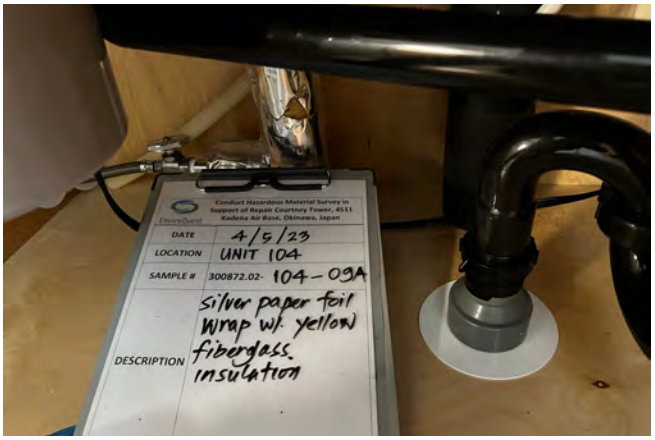

Unit 104

Non asbestos containing drywall ceiling.



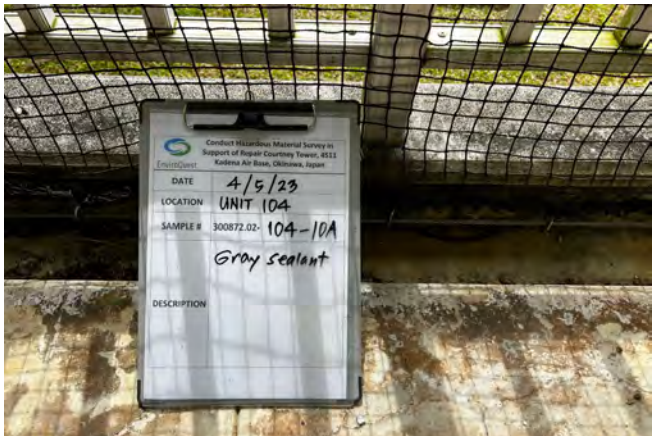

Unit 104

Non asbestos containing black sink undercoat.



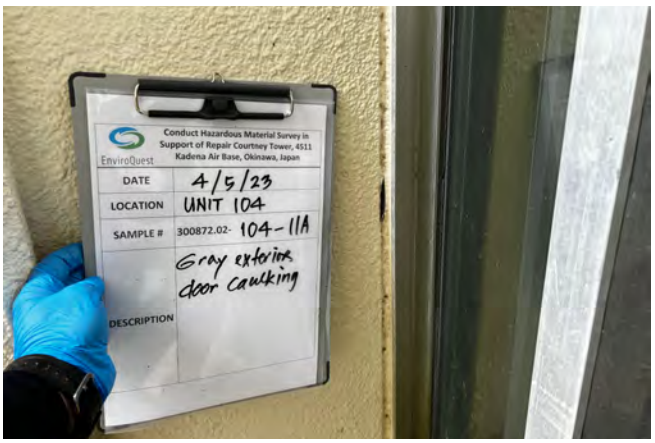

Unit 104

Non asbestos containing silver paper foil wrap with yellow fiberglass insulation.




Unit 104

Non asbestos containing gray sealant.




Unit 104

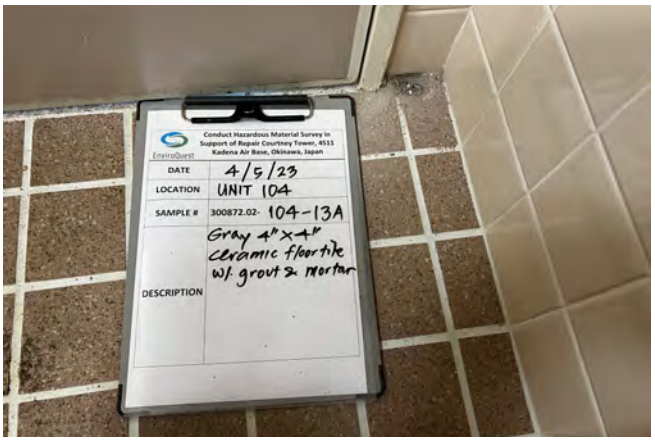
Non asbestos containing gray exterior door caulking.

Unit 104

Non asbestos containing window caulking.

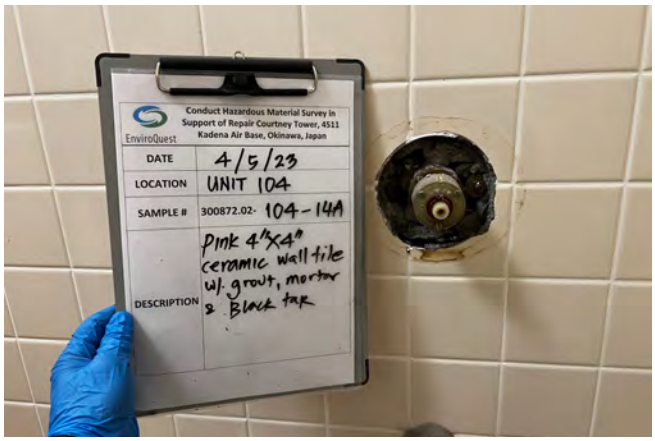
# REFERENCE PHOTOGRAPHS

EnviroQuest




Unit 104

Non asbestos containing gray 4”x4” ceramic floor tile with grout and mortar.

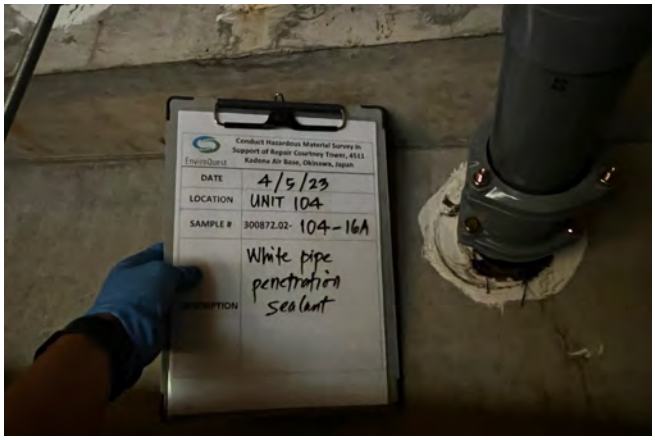



Unit 104

Non asbestos containing pink 4”x4” ceramic wall tile with grout mortar and black tar.

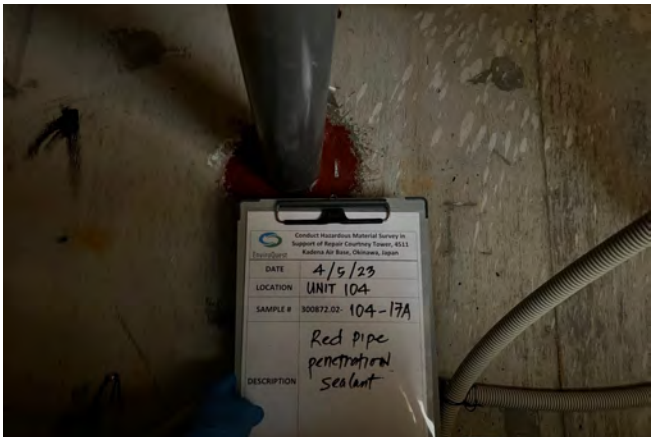
Unit 104

Non asbestos containing exterior beige wall coating with gray cementitious material.



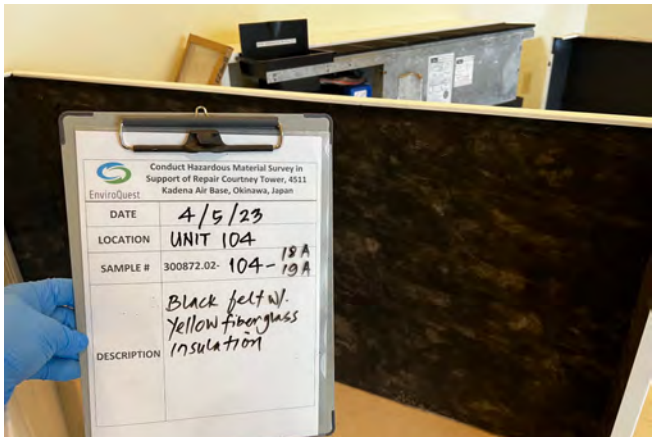

Unit 104

Non asbestos containing white pipe penetration sealant.




Unit 104

Non asbestos containing red pipe penetration sealant.

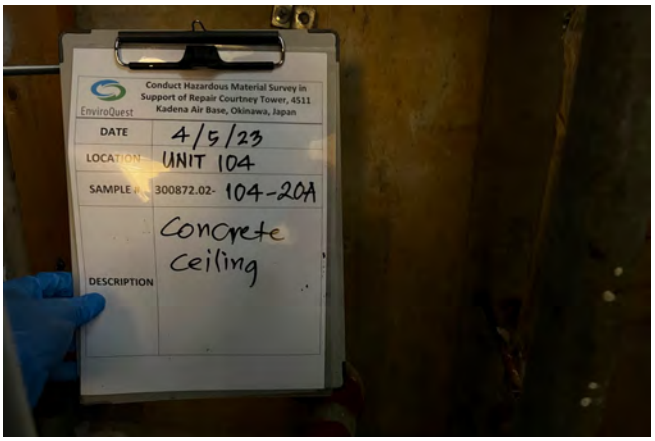



Unit 104

Non asbestos containing black felt with yellow fiberglass insulation.

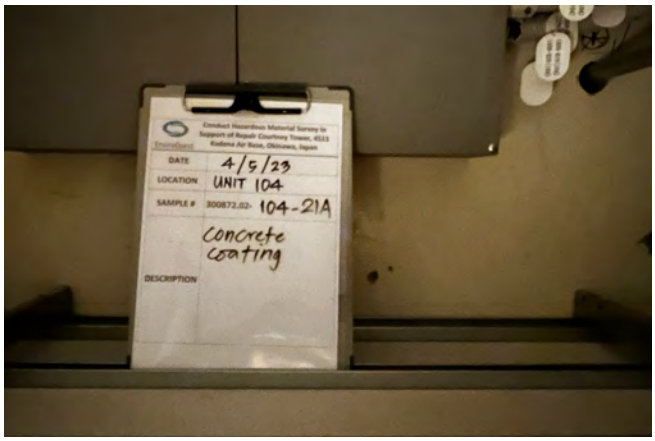
# REFERENCE PHOTOGRAPHS

EnviroQuest



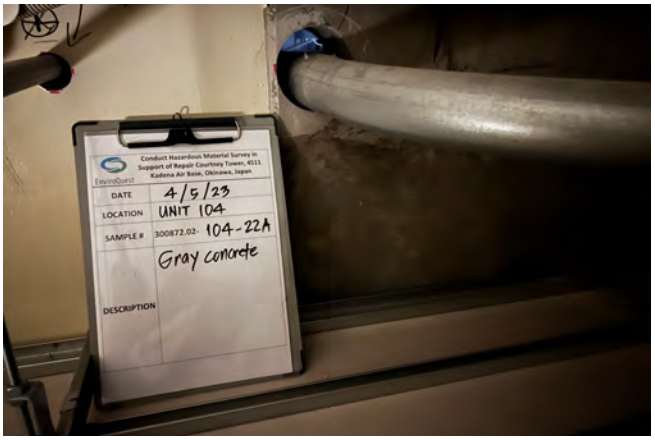

Unit 104

Non asbestos containing concrete ceiling.



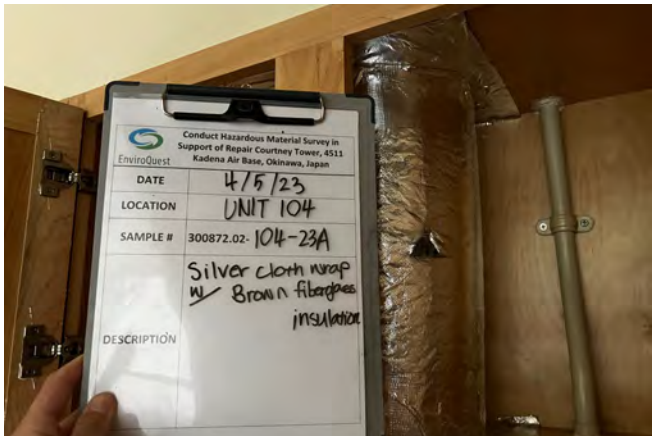

Unit 104

Non asbestos containing concrete coating.



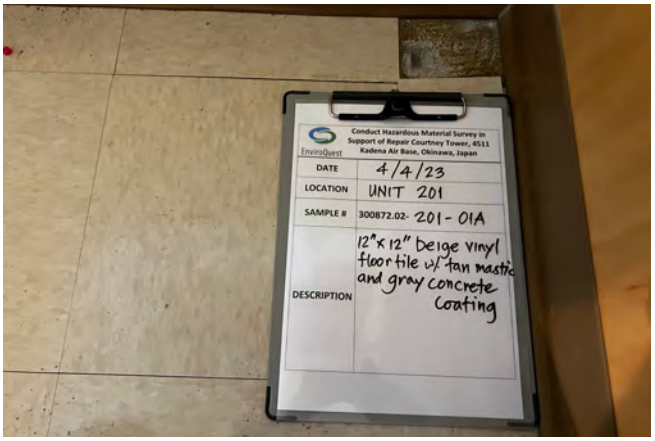

Unit 104

Non asbestos containing gray concrete.



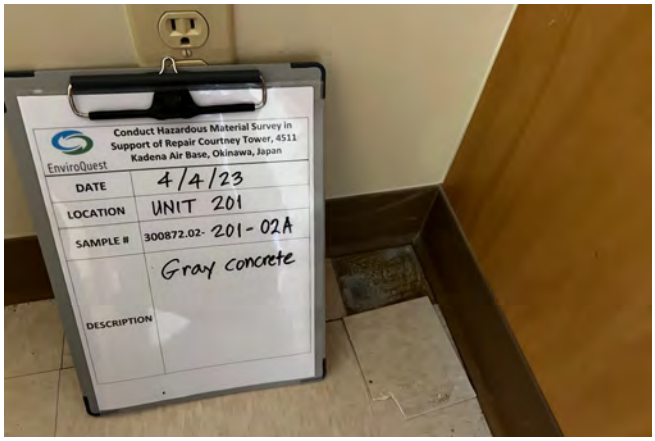

Unit 104

Non asbestos containing silver cloth wrap with brown fiberglass insulation.




Unit 201

Non asbestos containing 12”x12” beige vinyl floor tile with tan mastic and gray concrete coating.

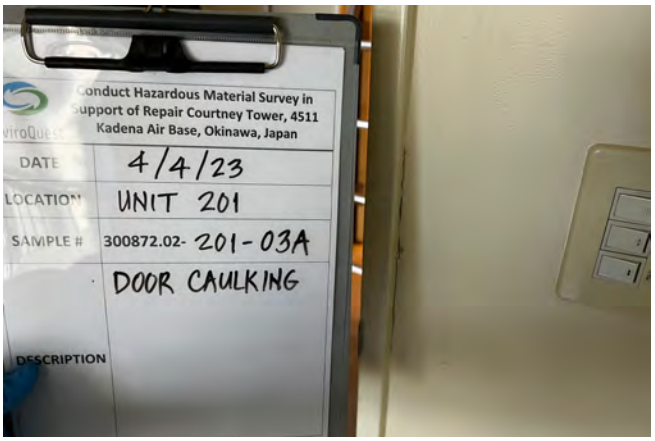



Unit 201

Non asbestos containing gray concrete.

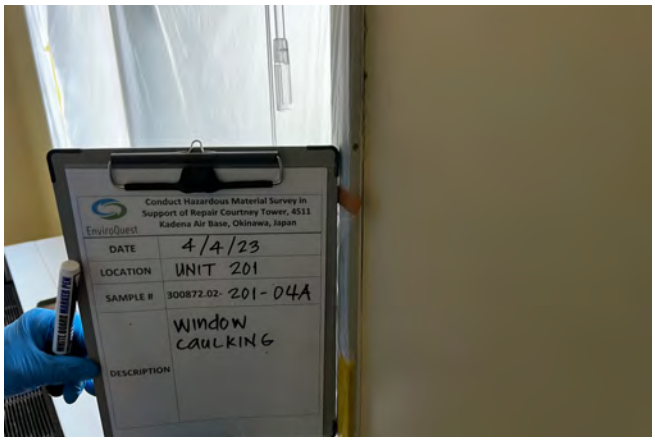
# REFERENCE PHOTOGRAPHS

EnviroQuest



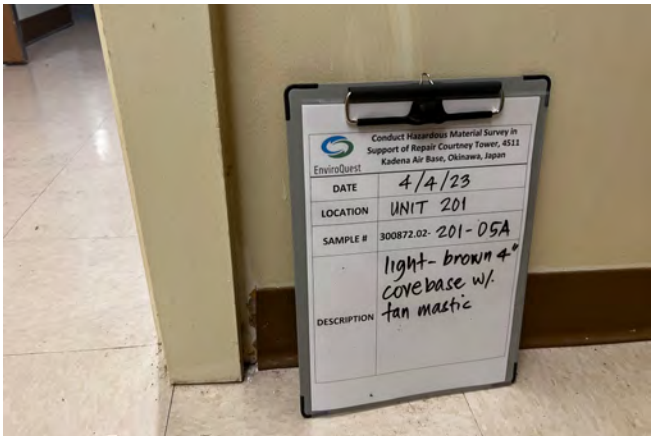

Unit 201

Non asbestos containing door caulking.



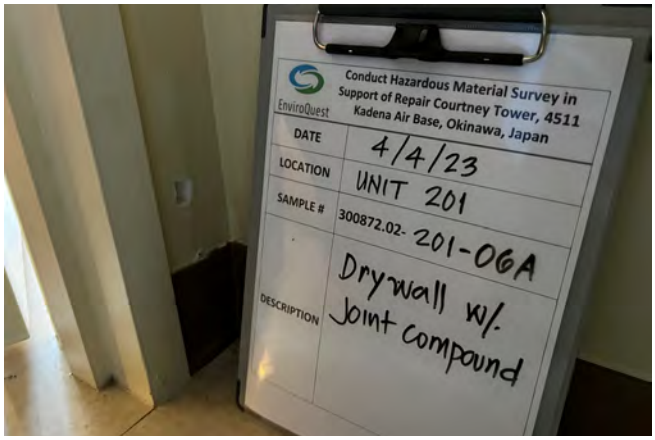

Unit 201

Non asbestos containing window caulking.



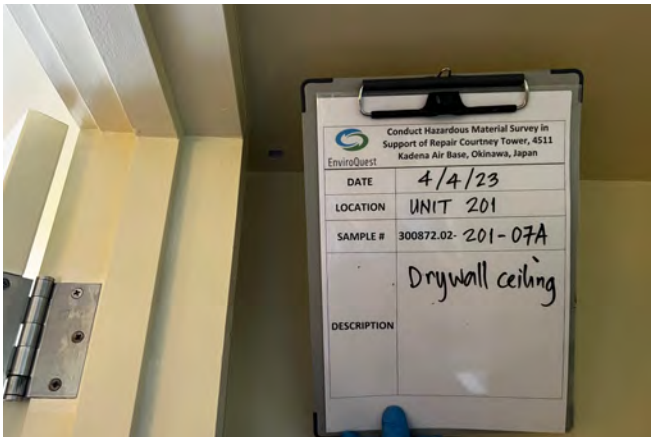

Unit 201

Non asbestos containing



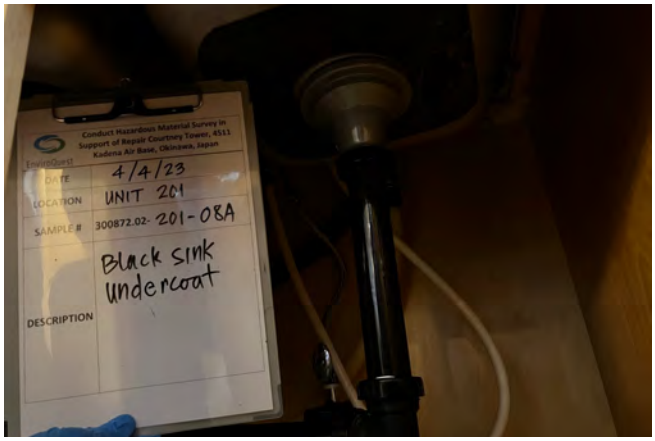

Unit 201

Non asbestos containing drywall with joint compound.




Unit 201

Non asbestos containing drywall ceiling.

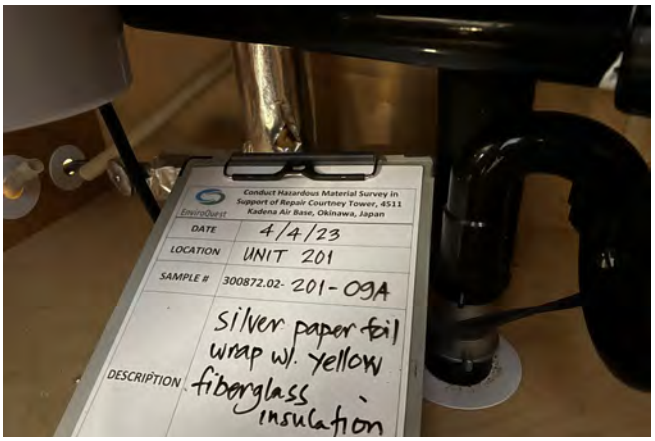



Unit 201

Non asbestos containing black sink undercoat.

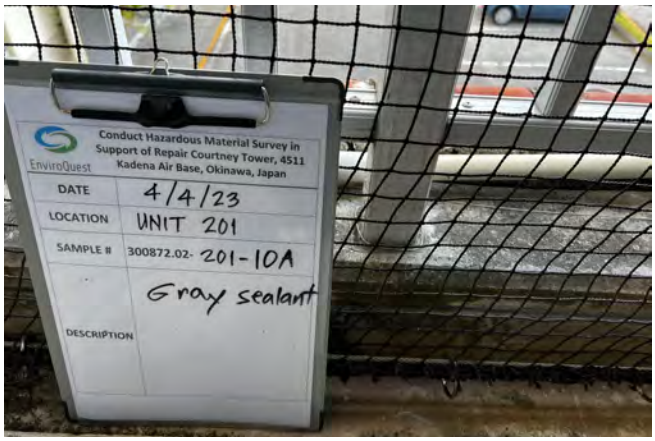
# REFERENCE PHOTOGRAPHS

EnviroQuest




Unit 201

Non asbestos containing silver paper foil wrap with yellow fiberglass insulation.

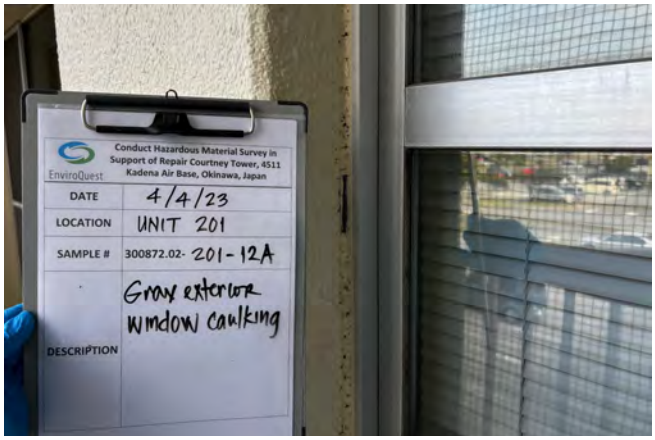



Unit 201

Non asbestos containing gray sealant.

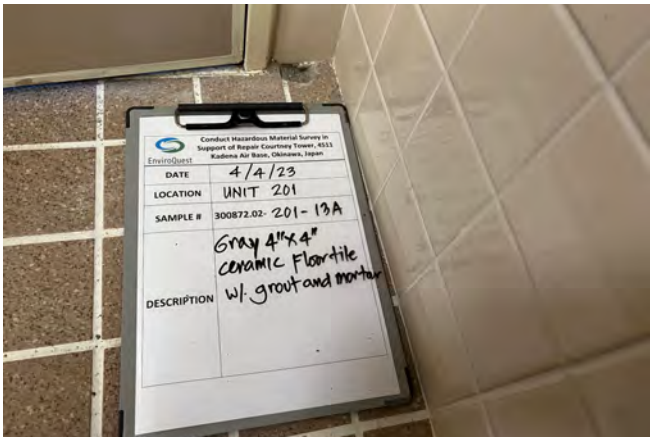
Unit 201

Non asbestos containing gray exterior door caulking.



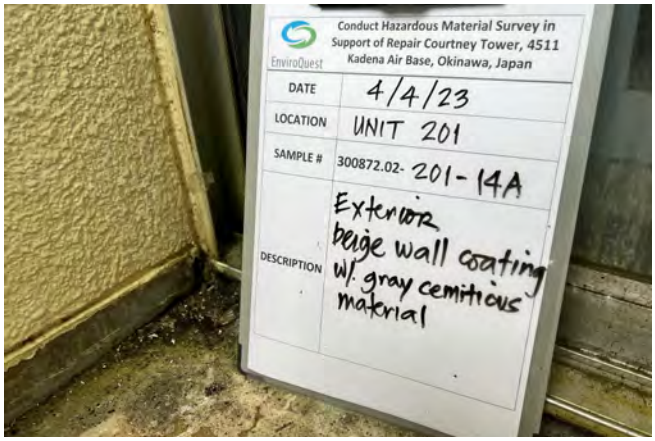

Unit 201

Non asbestos containing gray exterior window caulking.




Unit 201

Non asbestos containing gray 4”x4” ceramic floor tile with grout and mortar.




Unit 201

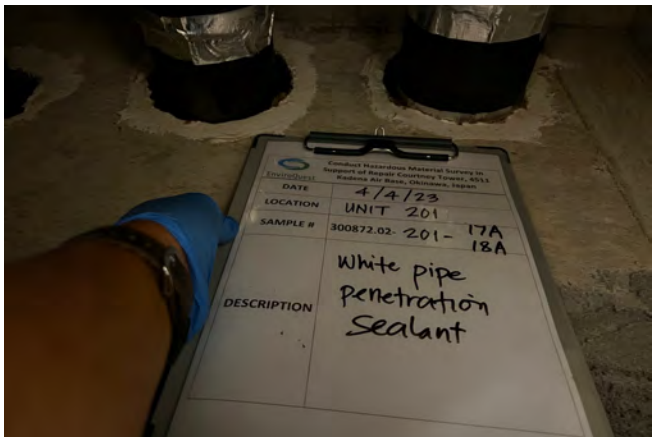
Non asbestos containing exterior beige wall coating with gray cementitious material.

# REFERENCE PHOTOGRAPHS

EnviroQuest

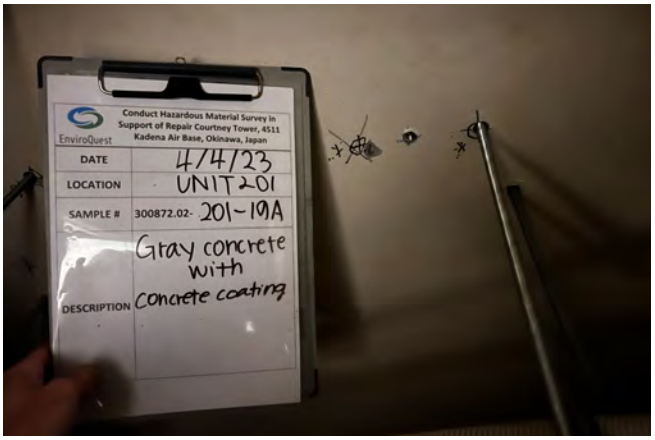
Unit 201

Non asbestos containing pink 4”x4” ceramic wall tile with grout, mortar and black tar.



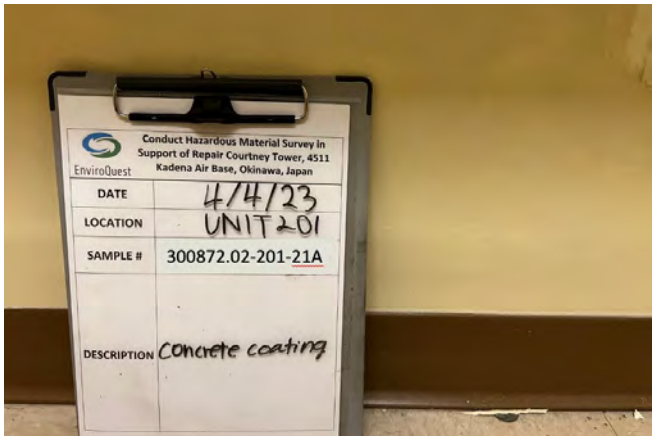

Unit 204

Asbestos containing white pipe penetration sealant.




Unit 201

Non asbestos containing gray concrete with concrete coating.

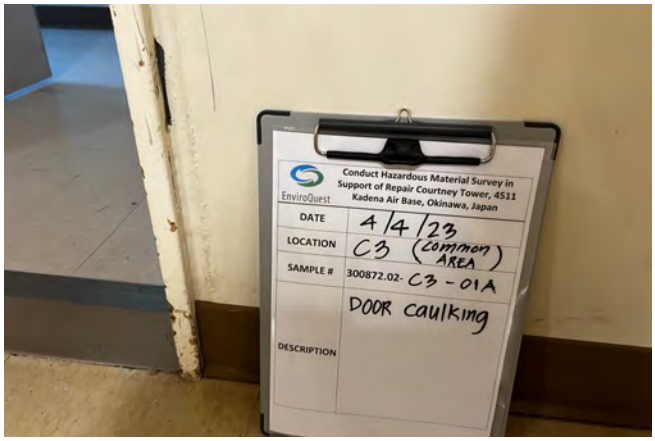



Unit 201

Non asbestos containing concrete coating.

Unit 201

Non asbestos containing gray concrete.

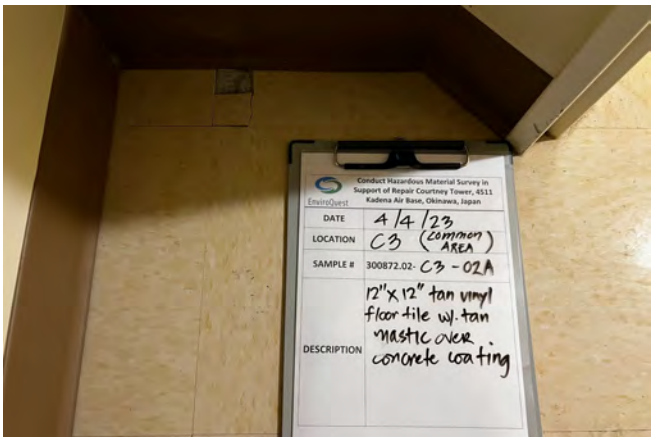



3rd floor Common Area

Non asbestos containing door caulking.

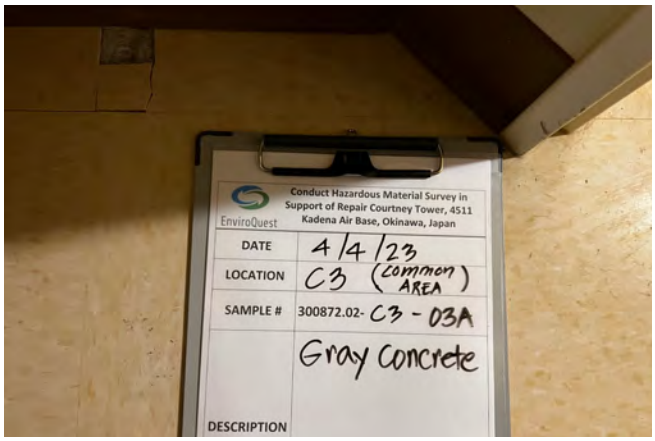
# REFERENCE PHOTOGRAPHS

EnviroQuest



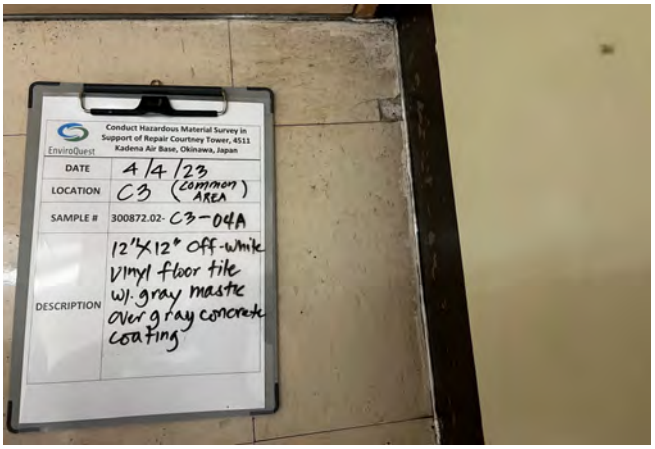

3rd floor Common Area

Non asbestos containing 12”x12” tan vinyl floor tile with tan mastic over concrete coating.



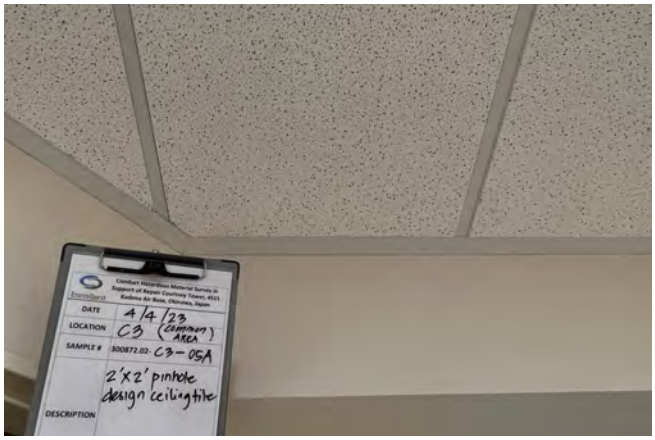

3rd floor Common Area

Non asbestos containing gray concrete.



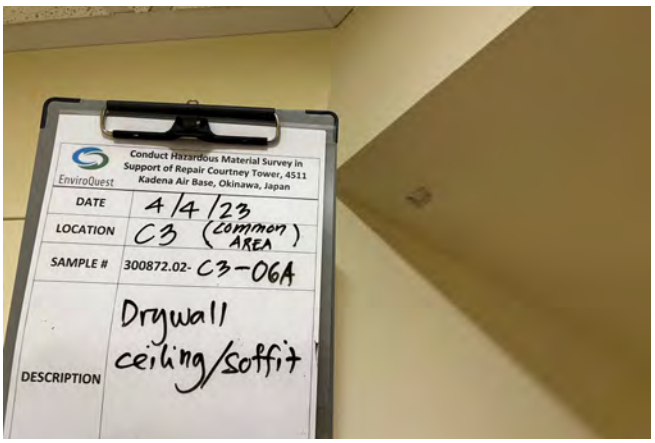

3rd floor Common Area

Non asbestos containing 12”12” off white vinyl floor tile with gray mastic over gray concrete coating.



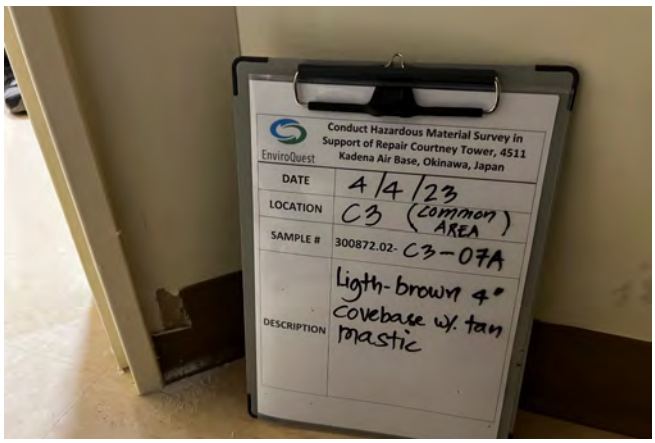

3rd floor Common Area

Non asbestos containing 2’x2’ pinhole design ceiling tile.




3rd floor Common Area

Non asbestos containing drywall ceiling/soffit.

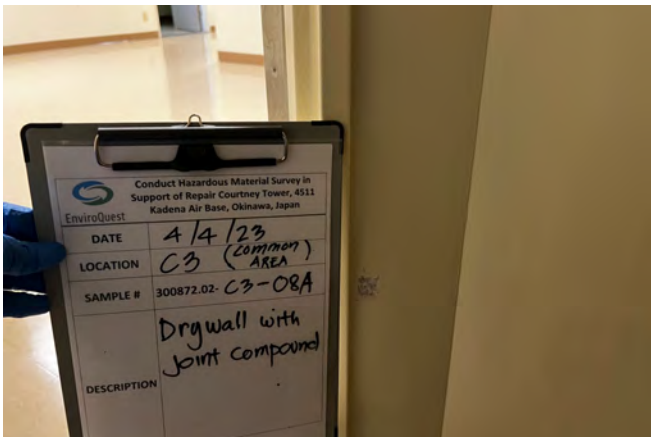



3rd floor Common Area

Non asbestos containing light brown 4” covebase with tan mastic.

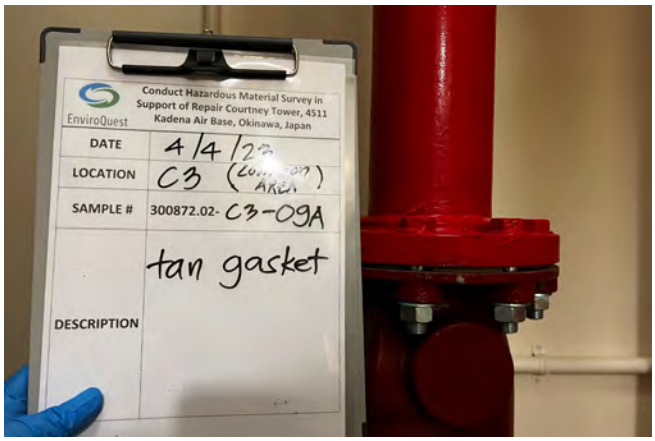
# REFERENCE PHOTOGRAPHS

EnviroQuest



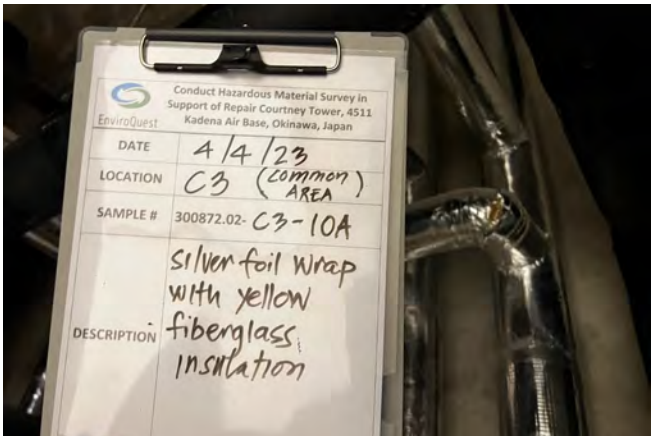

3rd floor Common Area

Non asbestos containing drywall with joint compound.



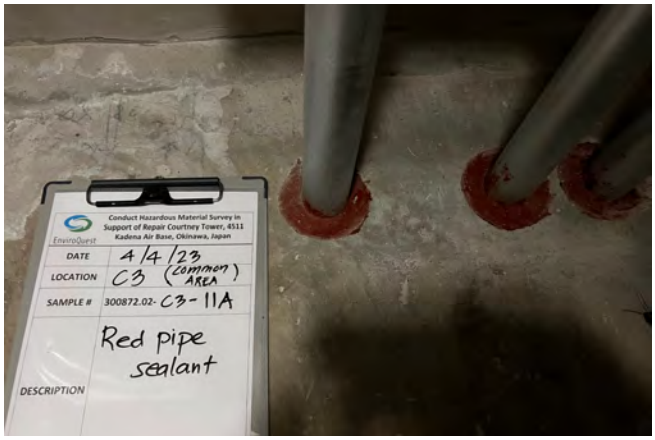

3rd floor Common Area

Non asbestos containing tan gasket.



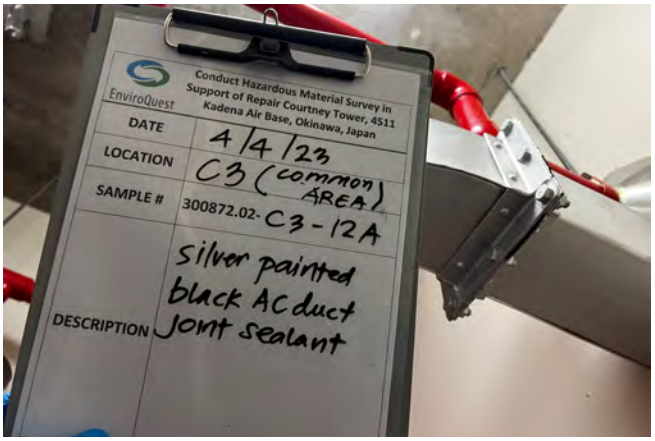

3rd floor Common Area

Non asbestos containing silver foil wrap with yellow fiberglass insulation.



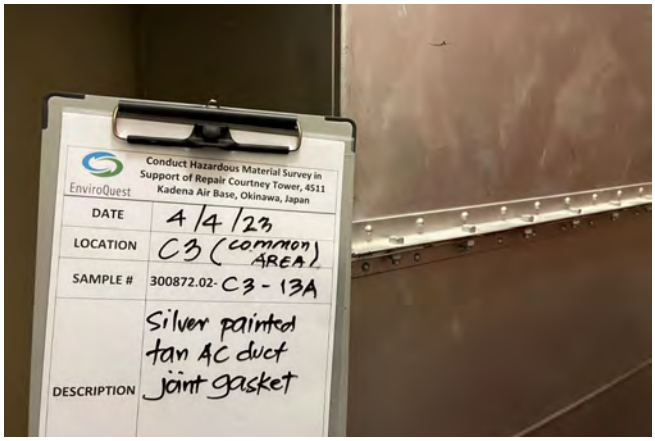

3rd floor Common Area

Non asbestos containing red pipe sealant.




3rd floor Common Area

Non asbestos containing silver painted black AC duct joint sealant.

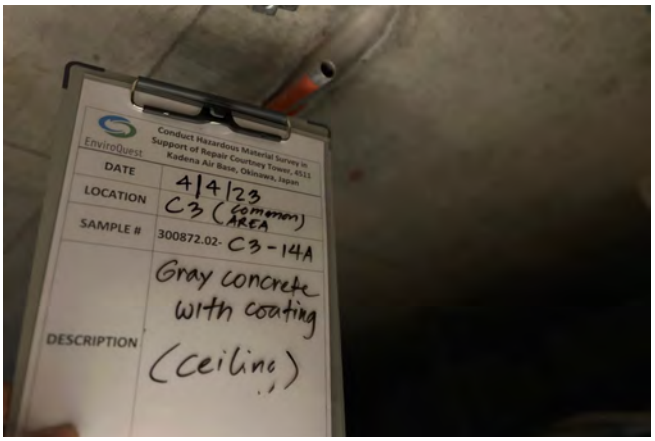



3rd floor Common Area

Non asbestos containing silver painted tan AC duct joint gasket.

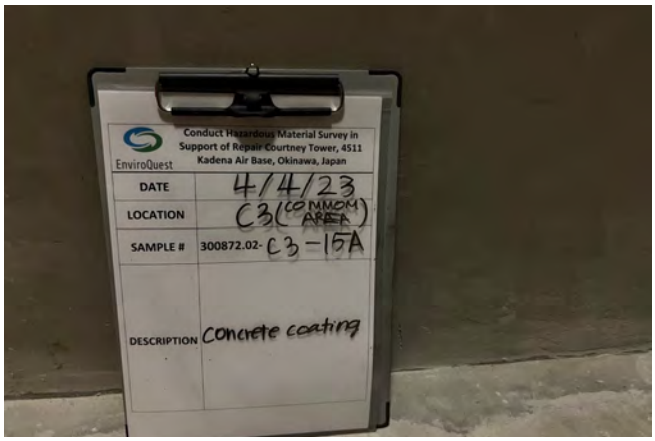
# REFERENCE PHOTOGRAPHS

EnviroQuest



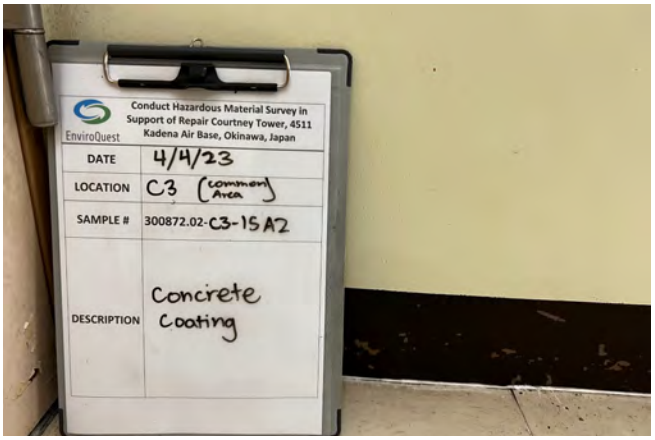

3rd floor Common Area

Non asbestos containing gray concrete with coating.



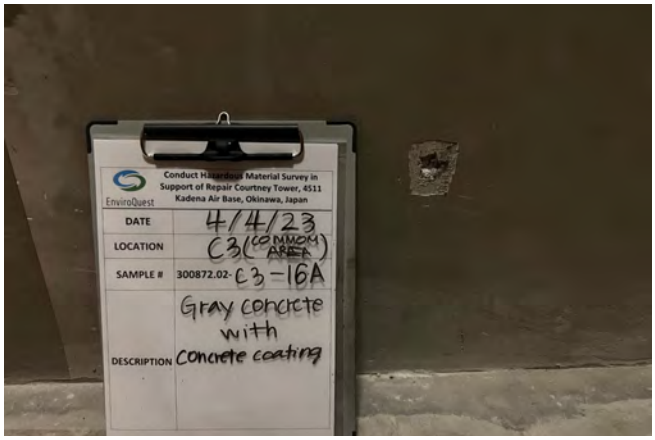

3rd floor Common Area

Non asbestos containing concrete coating.



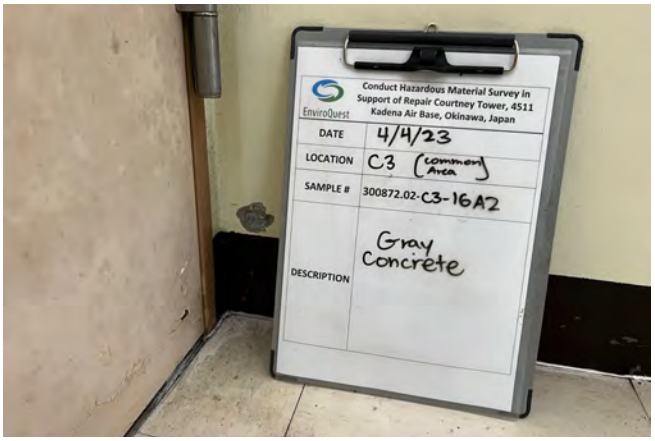

3rd floor Common Area

Non asbestos containing concrete coating.



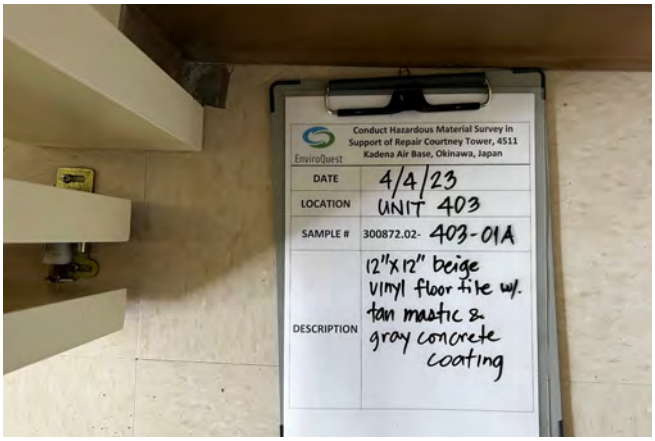

3rd floor Common Area

Non asbestos containing gray concrete with concrete coating.




3rd floor Common Area

Non asbestos containing gray concrete.

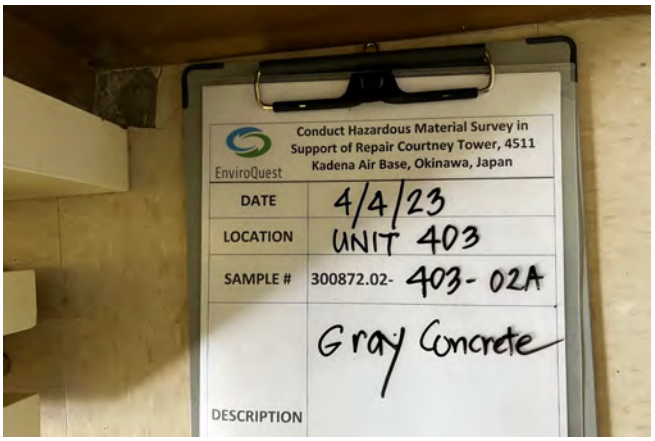



Unit 403

Non asbestos containing 12”x12” beige vinyl floor tile with tan mastic and gray concrete coating.

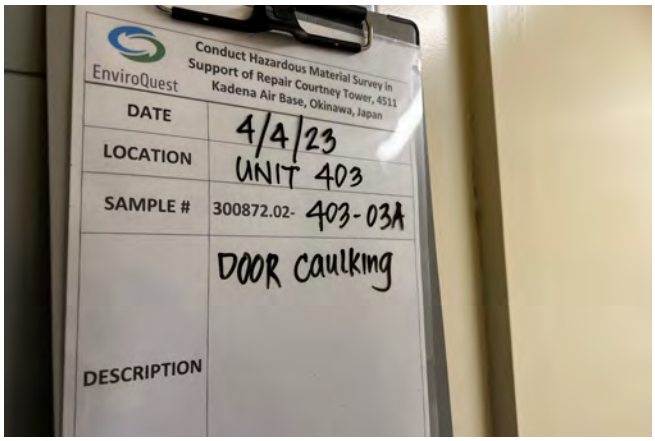
# REFERENCE PHOTOGRAPHS

EnviroQuest



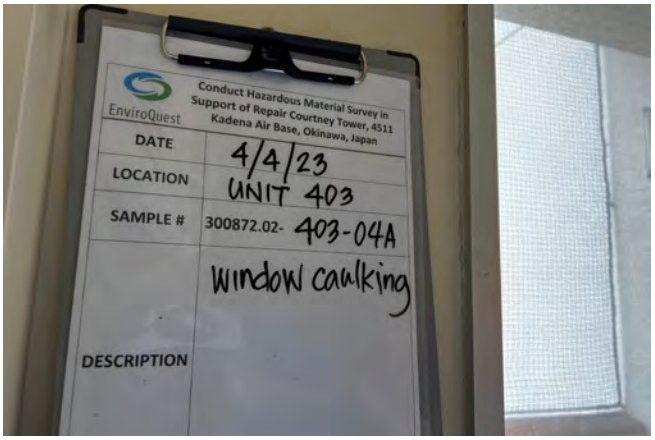

Unit 403

Non asbestos containing gray concrete.



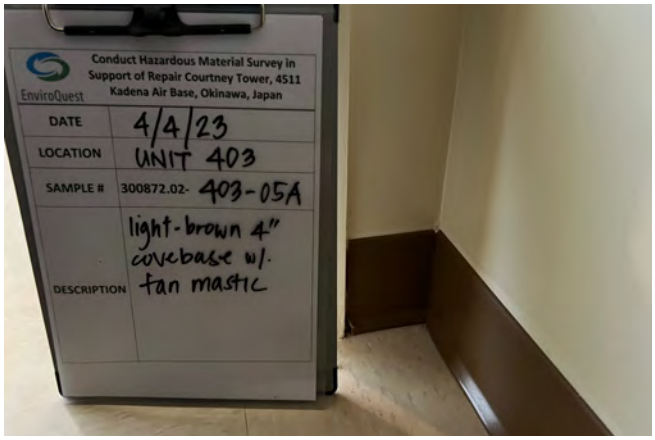

Unit 403

Non asbestos containing door caulking.



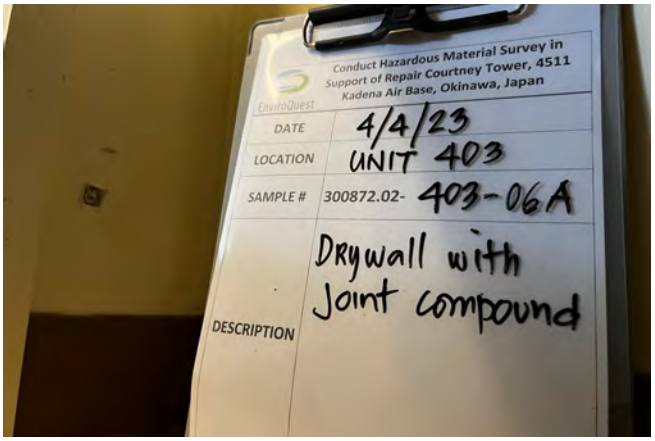

Unit 403

Asbestos containing window caulking.



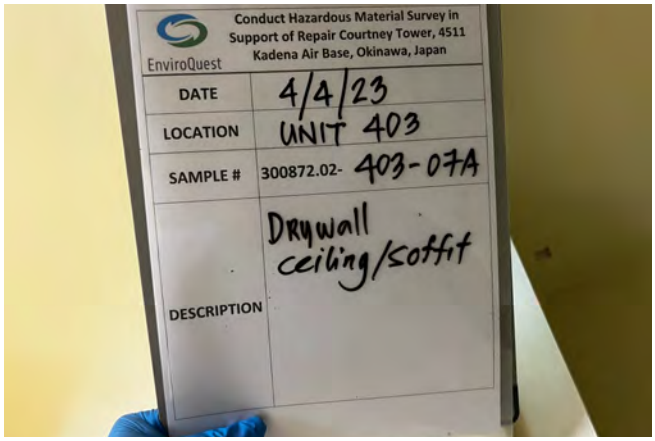

Unit 403

Non asbestos containing light brown 4” covebase with tan mastic.




Unit 403

Non asbestos containing drywall with joint compound.

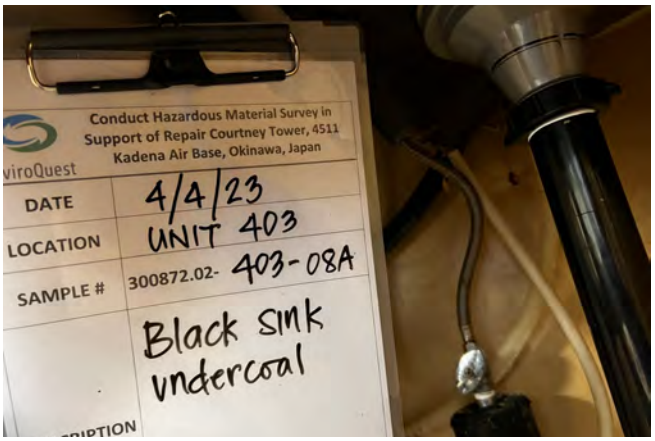



Unit 403

Non asbestos containing drywall ceiling/soffit.

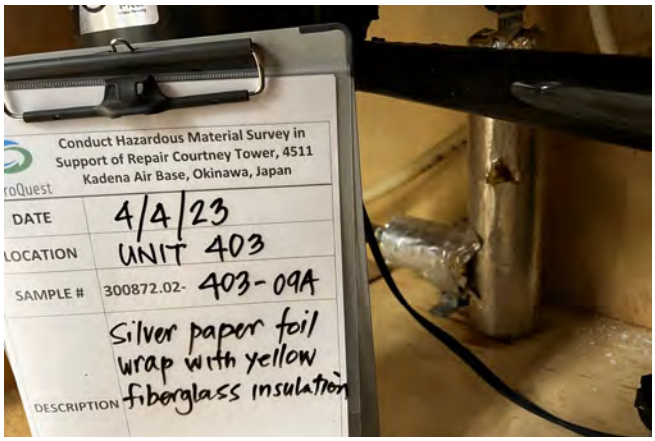
# REFERENCE PHOTOGRAPHS

EnviroQuest



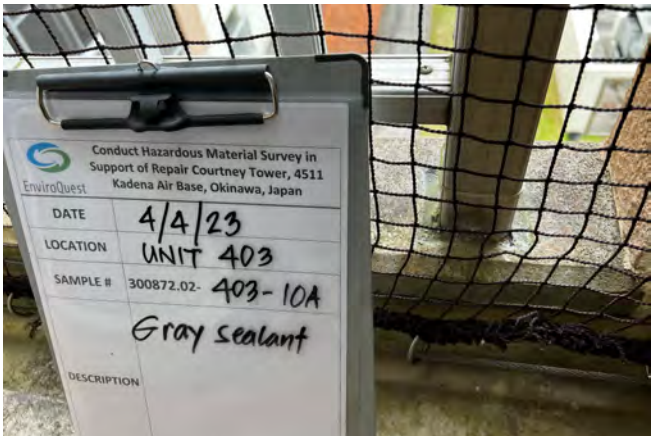

Unit 403

Non asbestos containing black sink undercoat.



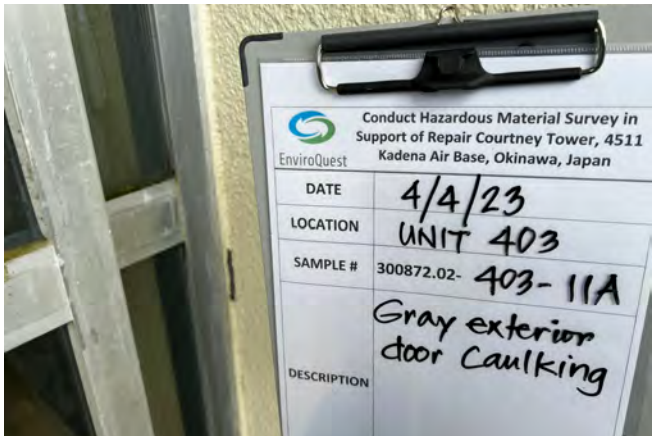

Unit 403

Non asbestos containing silver paper foil wrap with yellow fiberglass insulation.




Unit 403

Non asbestos containing gray sealant.

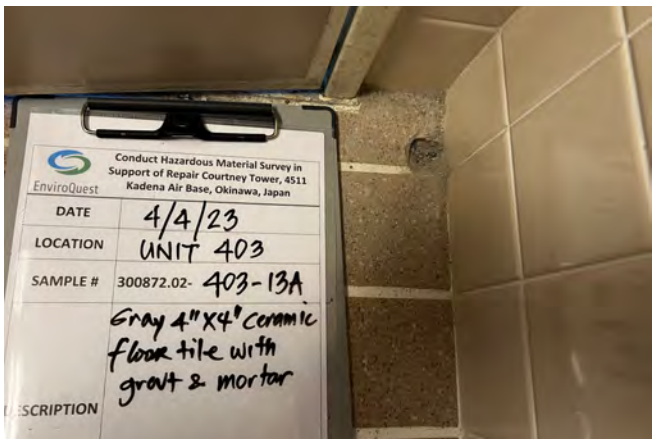



Unit 403

Non asbestos containing gray exterior door caulking.

Unit 403

Non asbestos containing gray exterior window caulking.

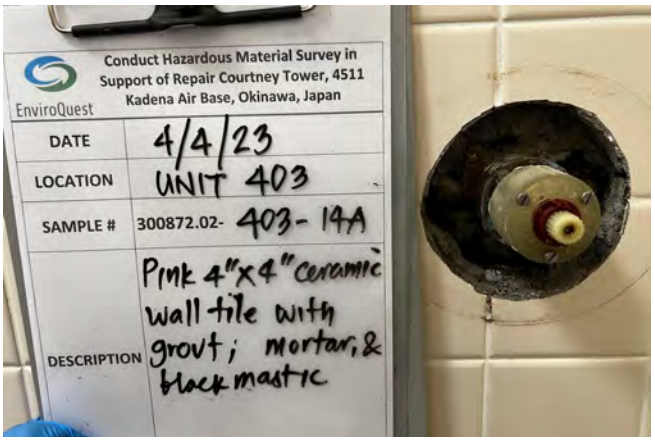



Unit 403

Non asbestos containing gray 4”x4” ceramic floor tile with grout and mortar.

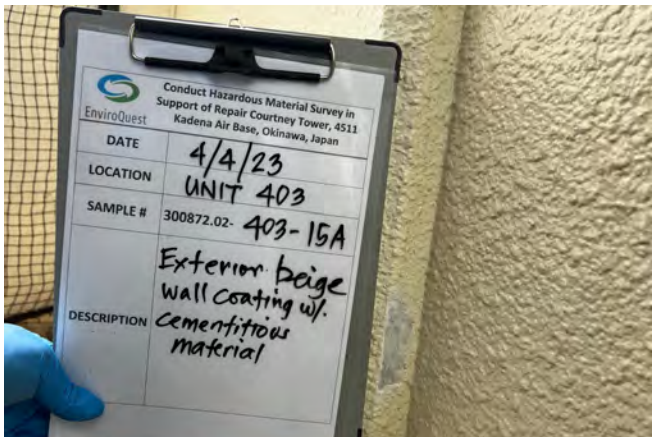
# REFERENCE PHOTOGRAPHS

EnviroQuest



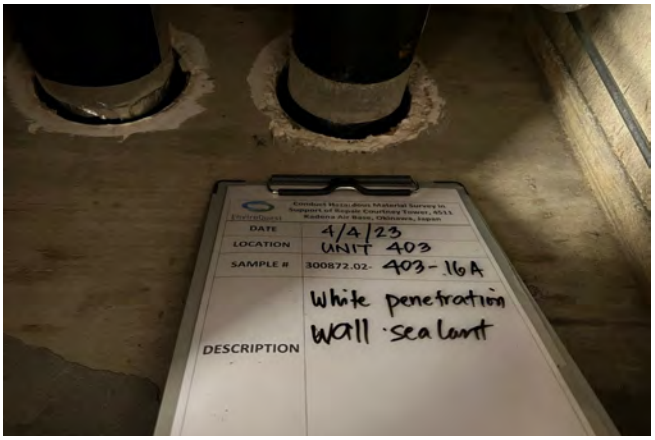

Unit 403

Non asbestos containing pink 4”x4” ceramic wall tile with grout, mortar and black mastic.



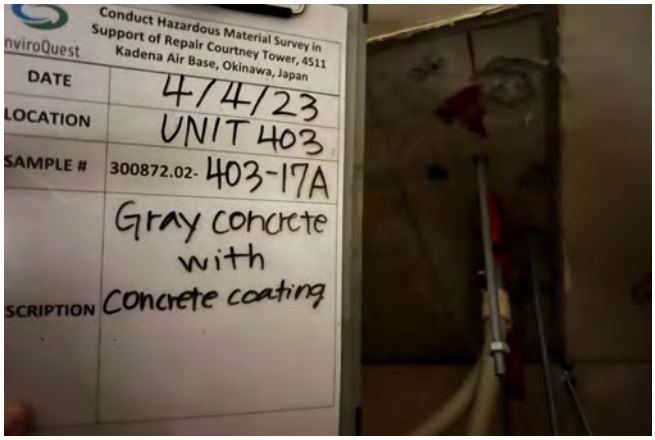

Unit 403

Non asbestos containing exterior beige wall coating with cementitious material.



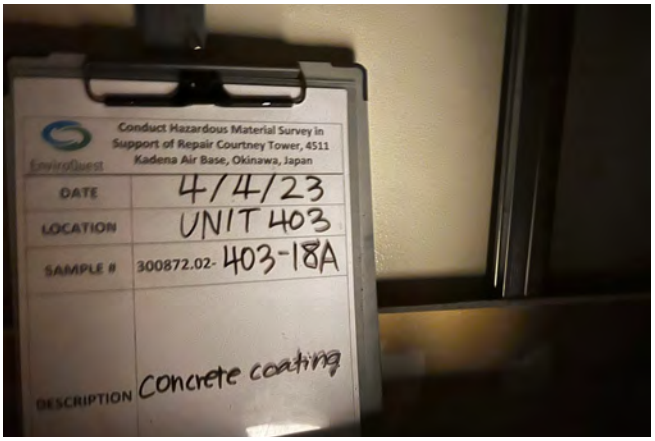

Unit 403

Asbestos containing white penetration wall sealant.



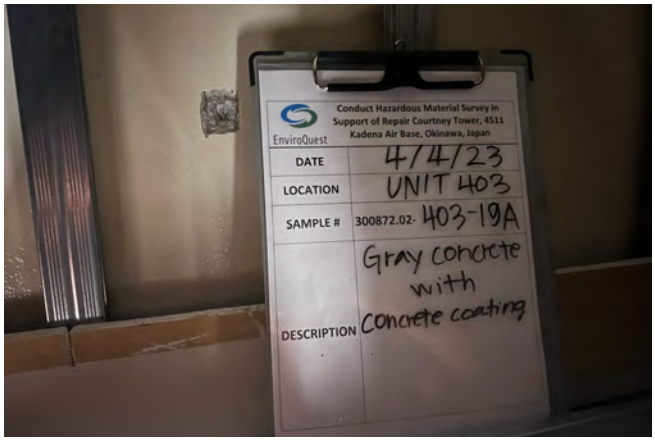

Unit 403

Non asbestos containing gray concrete with concrete coating.




Unit 403

Non asbestos containing concrete coating.

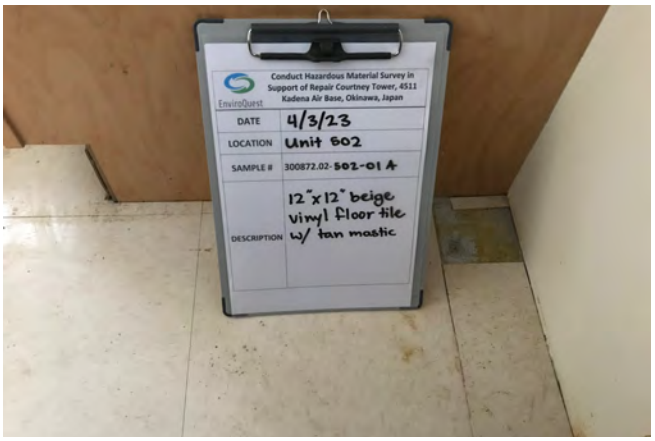



Unit 403

Non asbestos containing gray concrete with concrete coating.

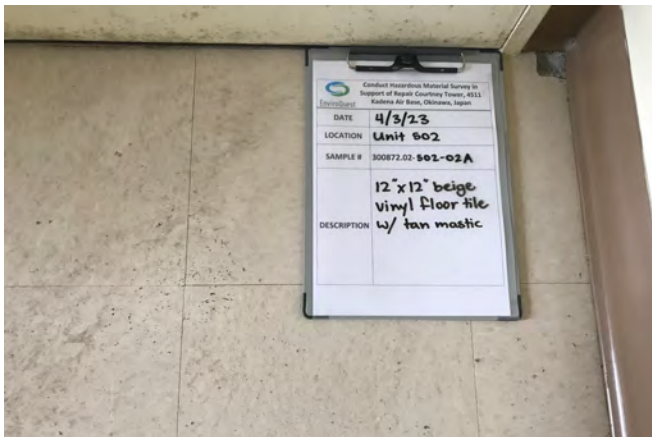
# REFERENCE PHOTOGRAPHS

EnviroQuest



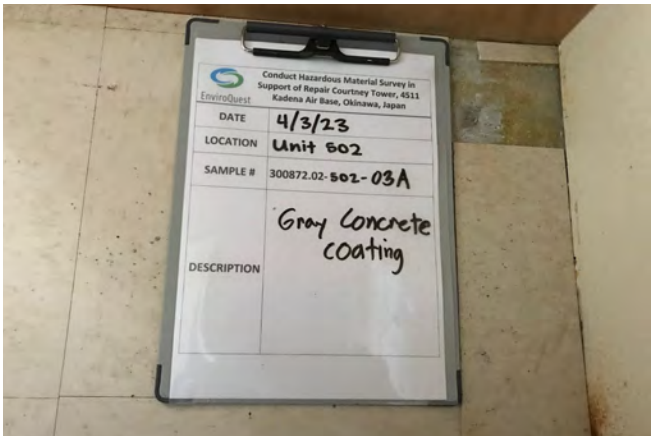

Unit 502

Non asbestos containing 12”x12” beige vinyl floor tile with tan mastic.



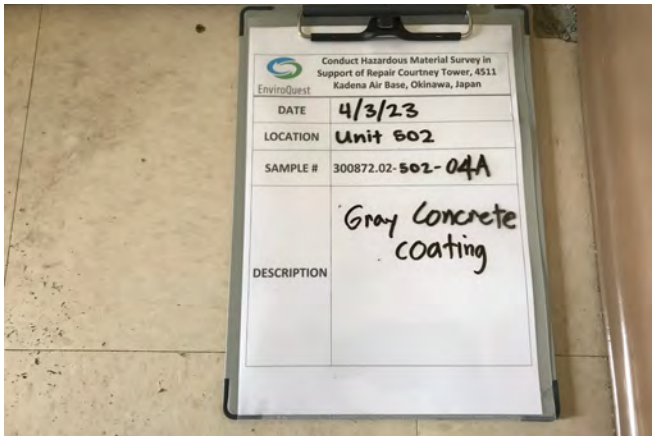

Unit 502

Non asbestos containing 12”x12” beige vinyl floor tile with tan mastic.



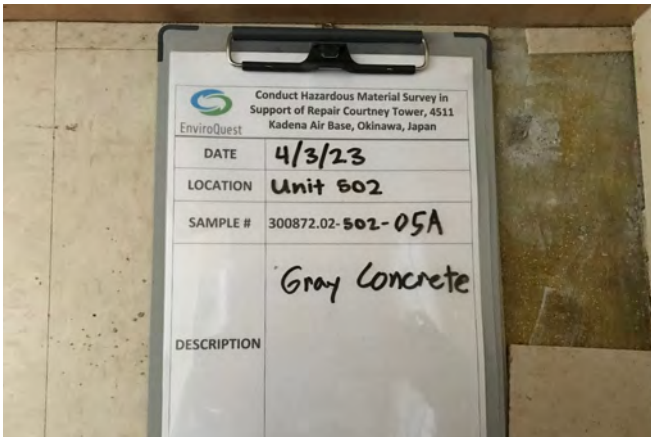

Unit 502

Non asbestos containing gray concrete coating.



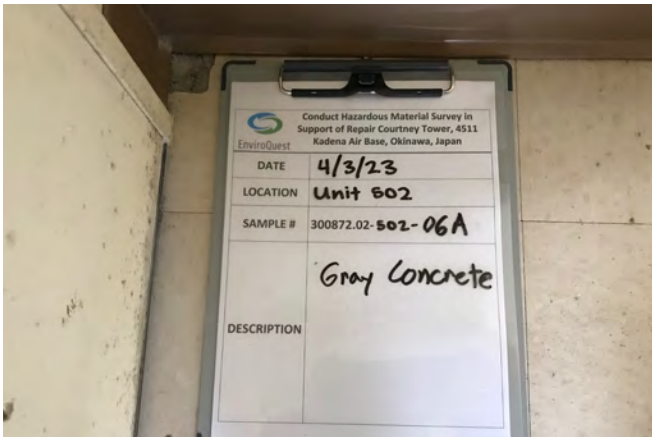

Unit 502

Non asbestos containing gray concrete coating.




Unit 502

Non asbestos containing gray concrete.

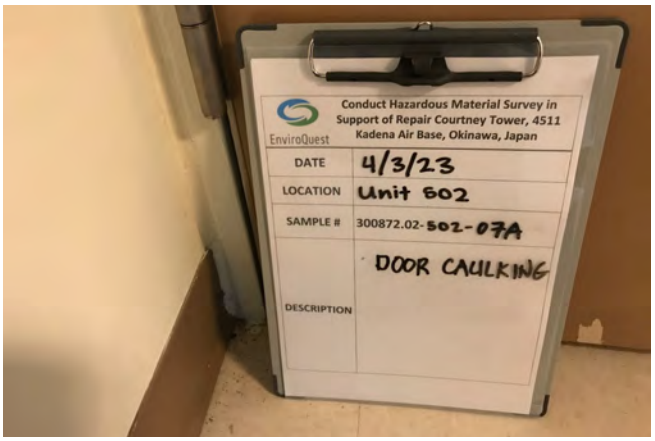



Unit 502

Non asbestos containing gray concrete.

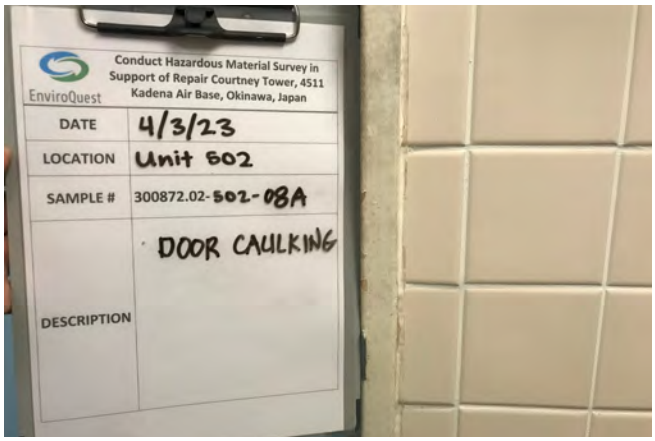
# REFERENCE PHOTOGRAPHS

EnviroQuest



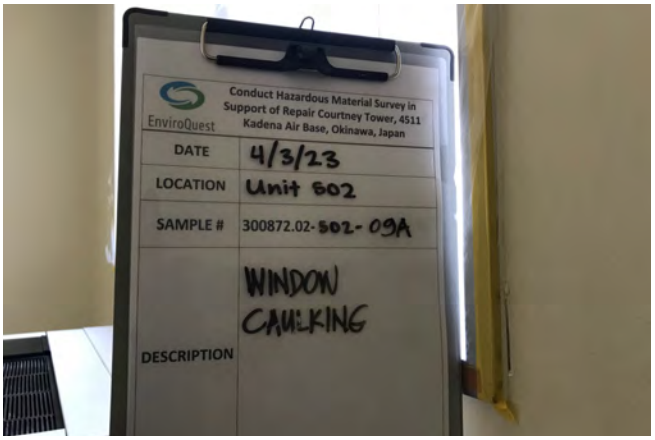

Unit 502

Non asbestos containing door caulking.



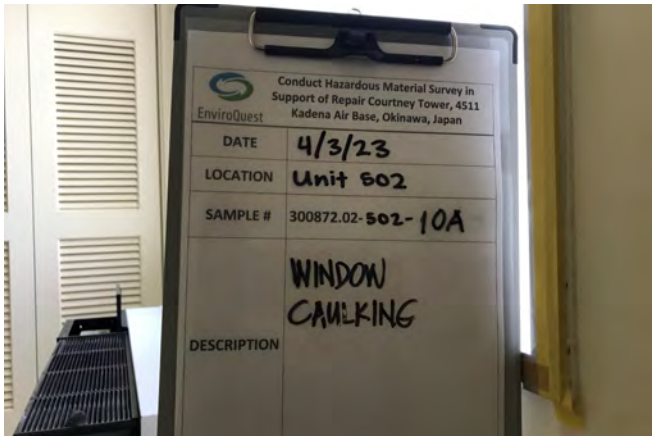

Unit 502

Non asbestos containing door caulking.



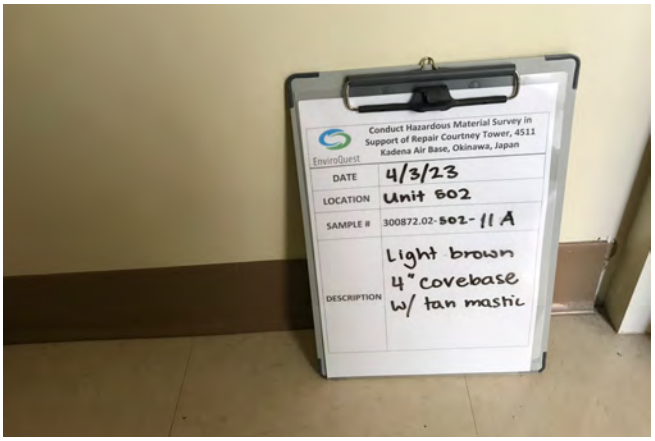

Unit 502

Non asbestos containing window caulking.



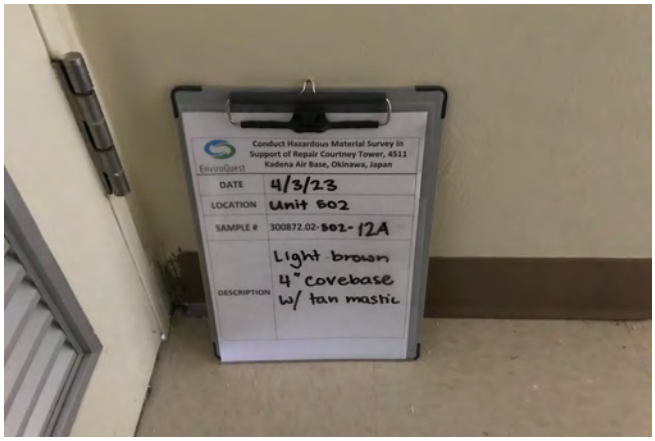

Unit 502

Non asbestos containing window caulking.




Unit 502

Asbestos containing mastic under non asbestos containing light brown 4” covebase.

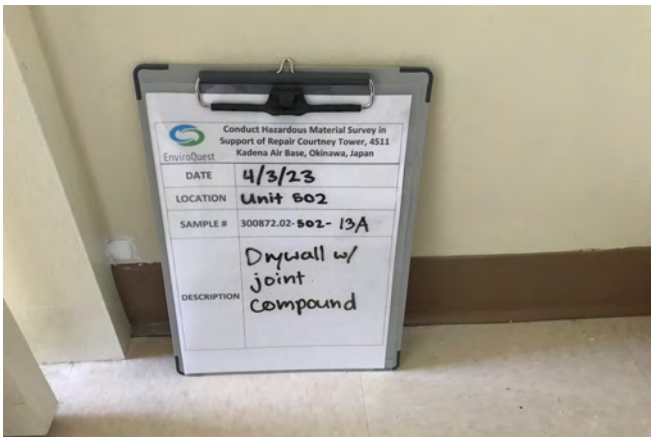



Unit 502

Non asbestos containing light brown 4” covebase with tan mastic.

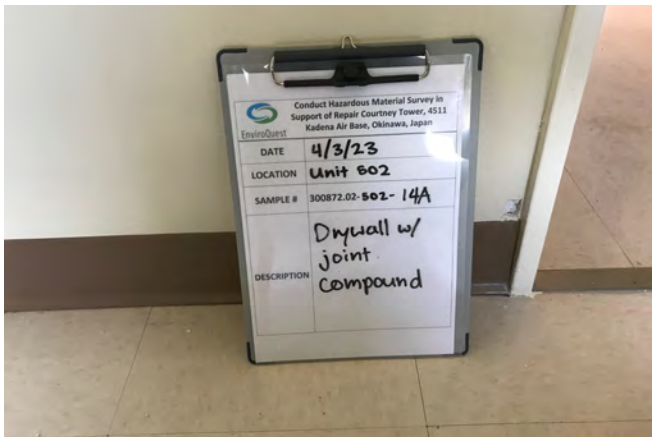
# REFERENCE PHOTOGRAPHS

EnviroQuest



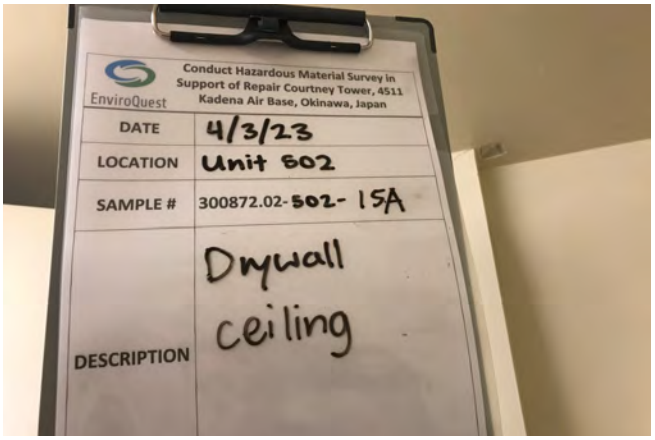

Unit 502

Non asbestos containing drywall with joint compound.



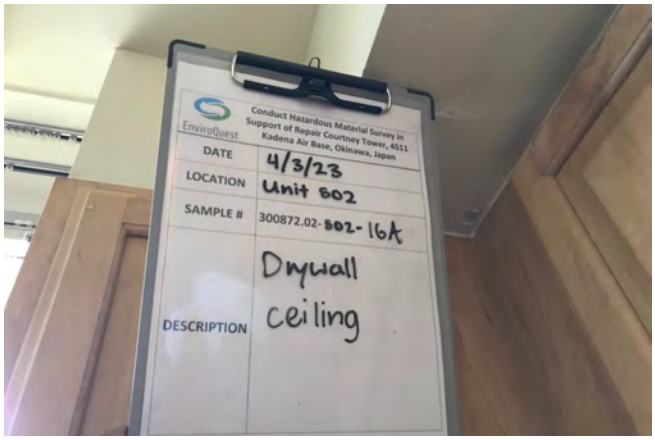

Unit 502

Non asbestos containing drywall with joint compound.



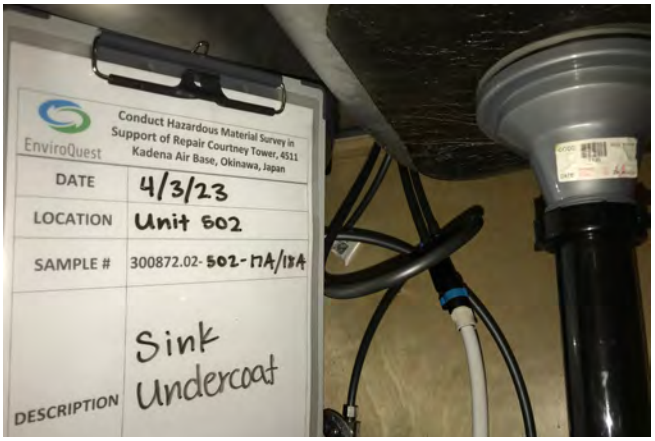

Unit 502

Non asbestos containing drywall ceiling.



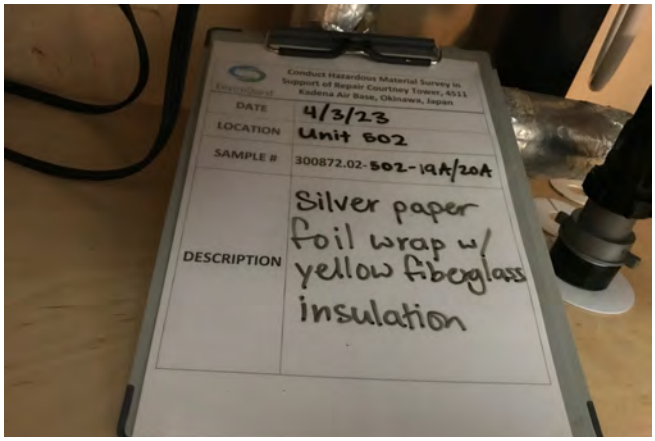

Unit 502

Non asbestos containing drywall ceiling.




Unit 502

Non asbestos containing sink undercoat.

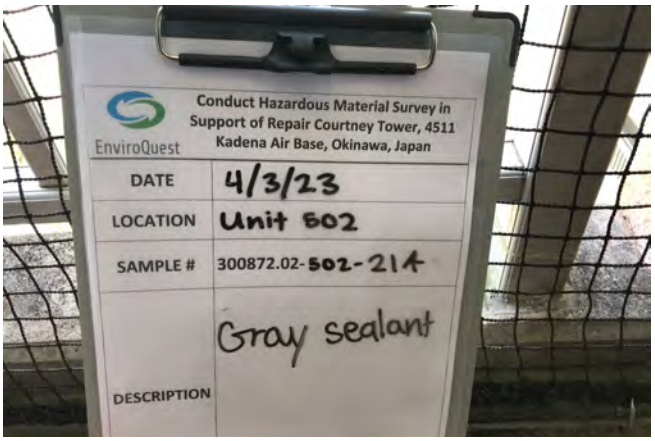



Unit 502

Non asbestos containing silver paper foil wrap with yellow fiberglass insulation.

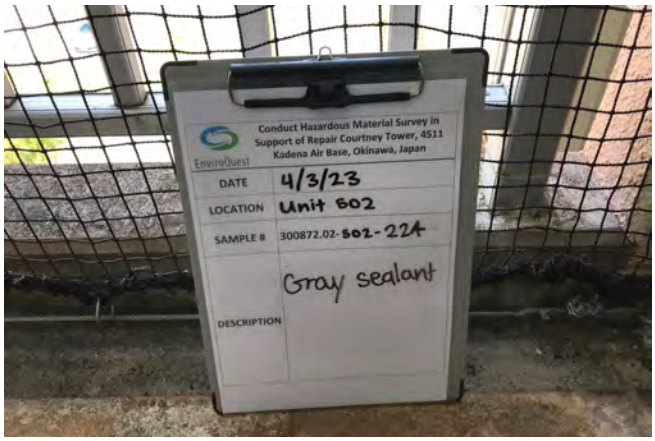
# REFERENCE PHOTOGRAPHS

EnviroQuest




Unit 502

Non asbestos containing gray sealant.

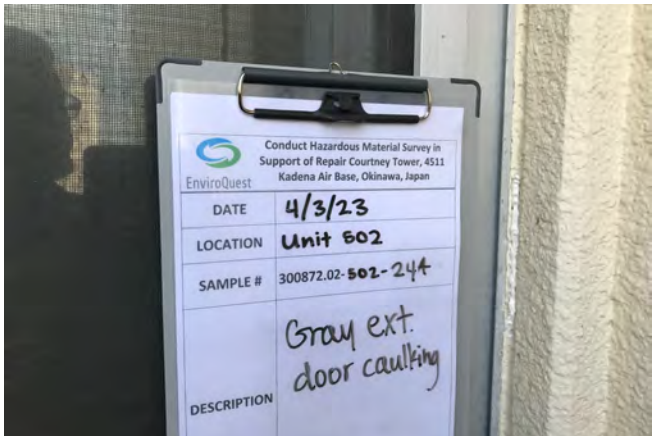



Unit 502

Non asbestos containing gray sealant.

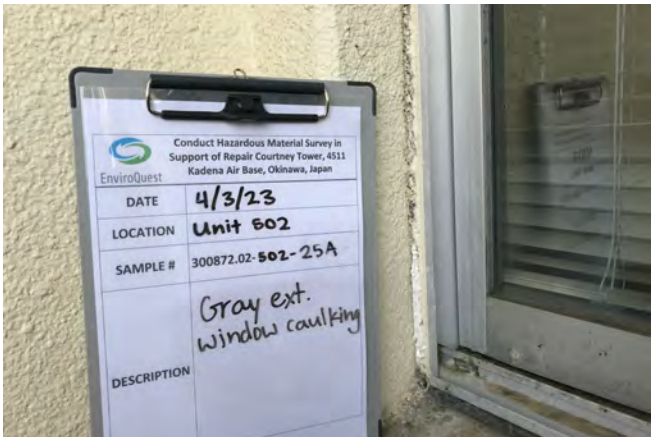
Unit 502

Non asbestos containing gray exterior door caulking.



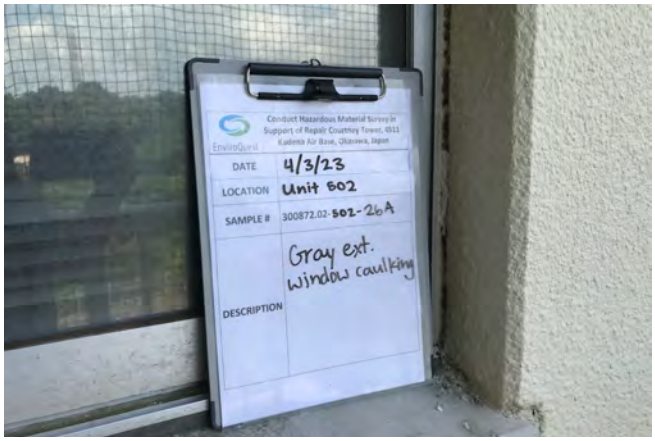

Unit 502

Non asbestos containing gray exterior door caulking.




Unit 502

Non asbestos containing gray exterior window caulking.

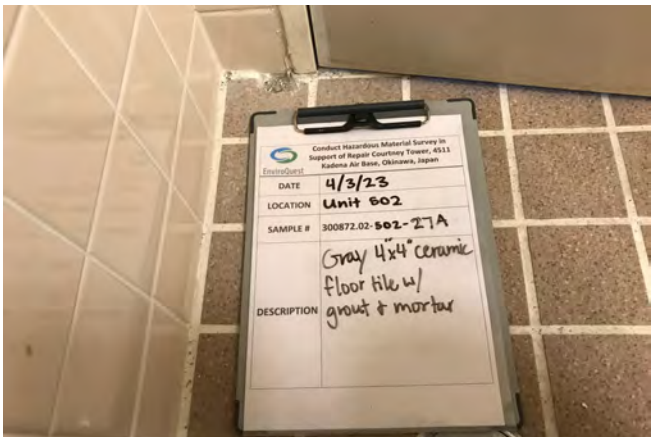



Unit 502

Non asbestos containing gray exterior window caulking.

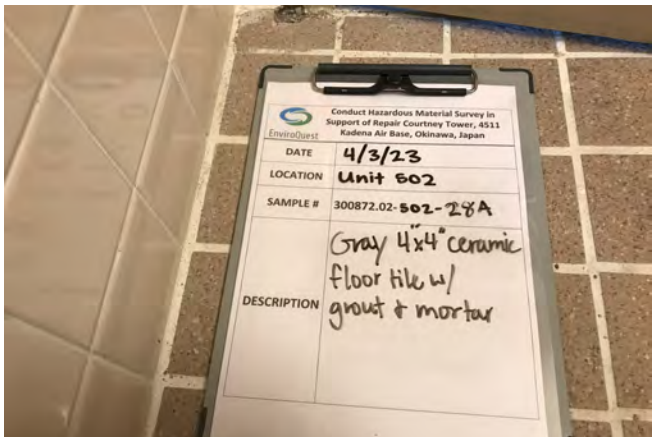
# REFERENCE PHOTOGRAPHS

EnviroQuest



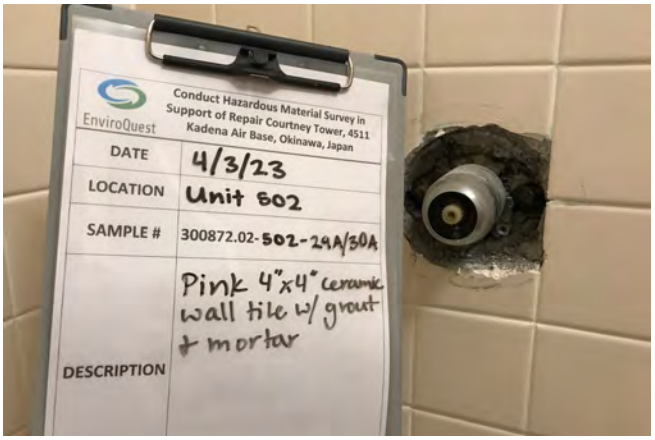

Unit 502

Non asbestos containing gray 4”x4” ceramic floor tile with grout and mortar.



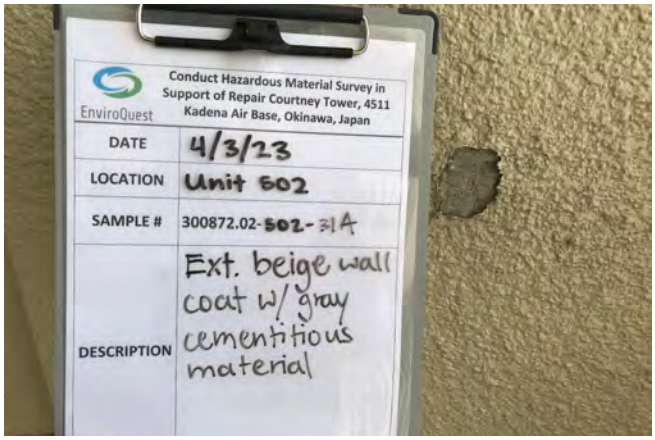

Unit 502

Non asbestos containing gray 4”x4” ceramic floor tile with grout and mortar.



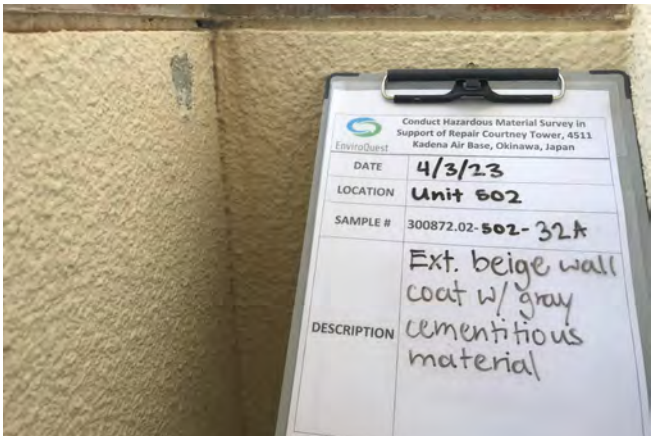

Unit 502

Non asbestos containing pink 4”x4” ceramic wall tile with grout and mortar.



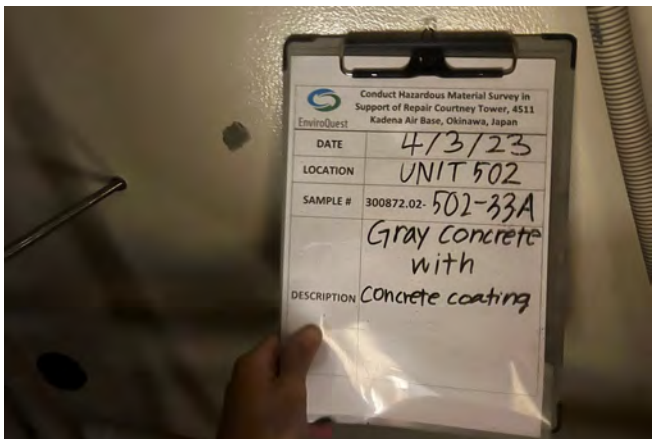

Unit 502

Non asbestos containing exterior beige wall coat with gray cementitious material.




Unit 502

Non asbestos containing exterior beige wall coat with gray cementitious material.

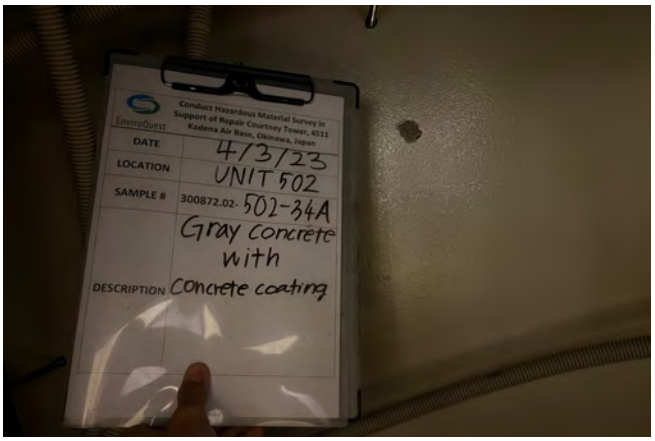



Unit 502

Non asbestos containing gray concrete with concrete coating.

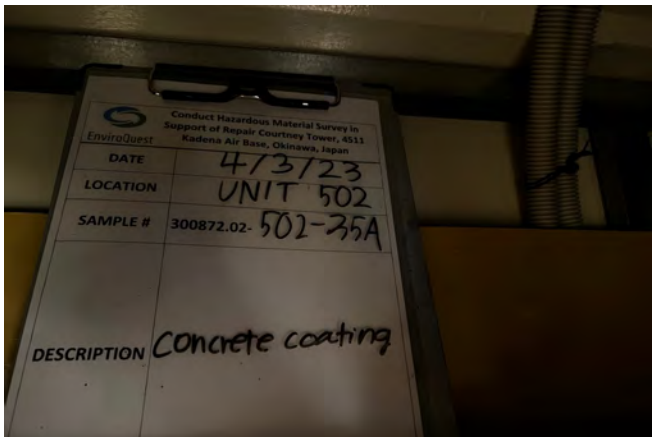
# REFERENCE PHOTOGRAPHS

EnviroQuest



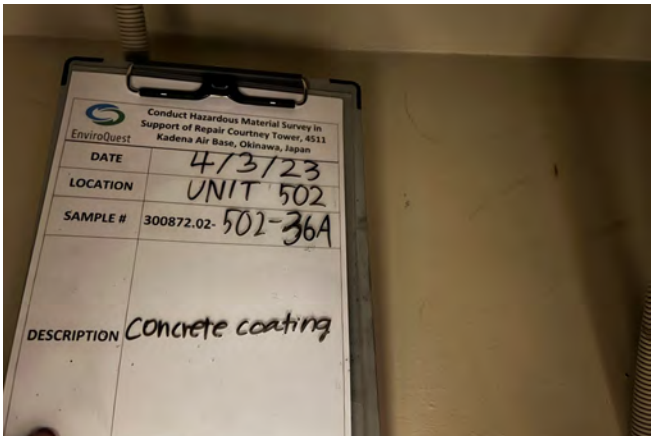

Unit 502

Non asbestos containing gray concrete with concrete coating.



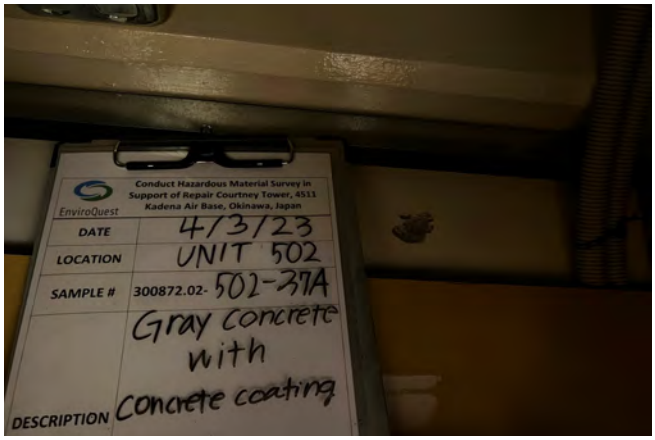

Unit 502

Non asbestos containing concrete coating.



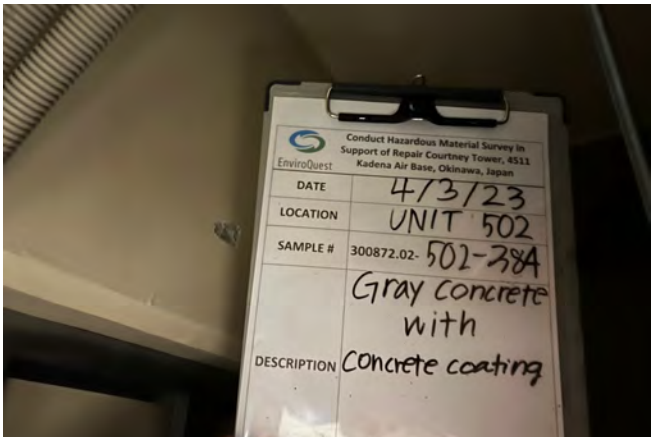

Unit 502

Non asbestos containing concrete coating.



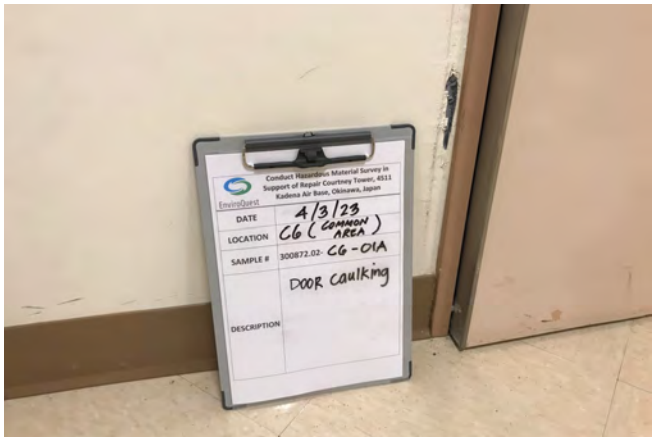

Unit 502

Non asbestos containing gray concrete with concrete coating.




Unit 502

Non asbestos containing gray concrete with concrete coating.

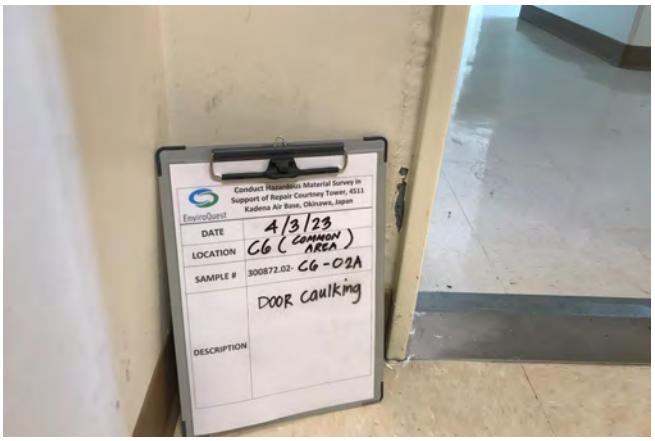



6th floor Common Area

Non asbestos containing door caulking.

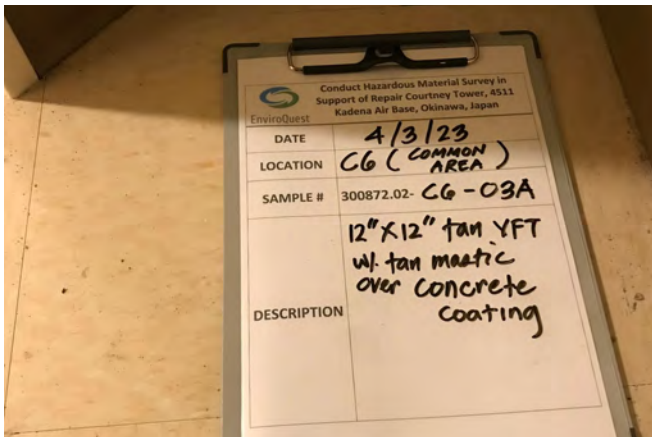
# REFERENCE PHOTOGRAPHS

EnviroQuest



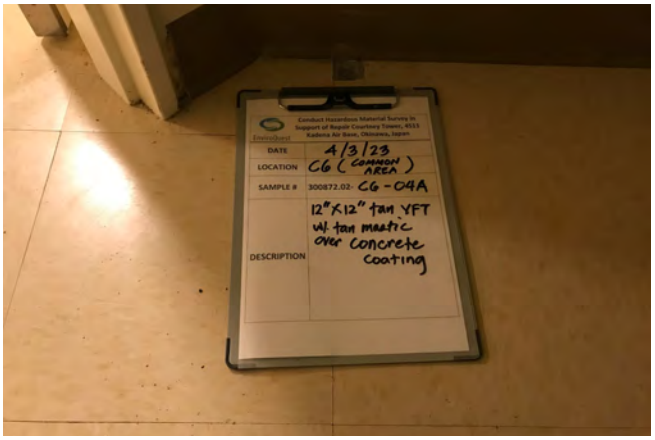

6th floor Common Area

Non asbestos containing door caulking.



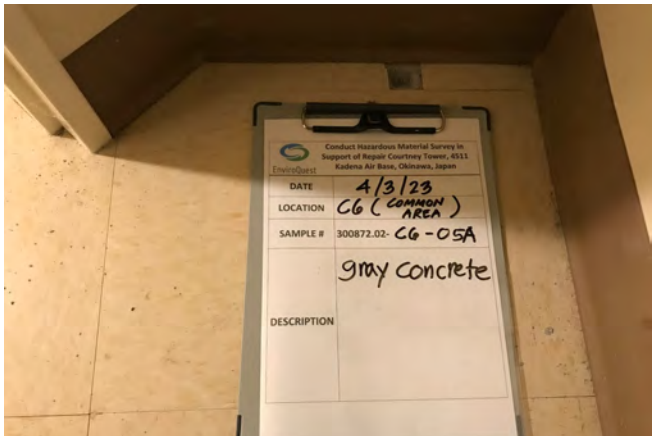

6th floor Common Area

Non asbestos containing 12”x12” tan vinyl floor tile with tan mastic over concrete coating.



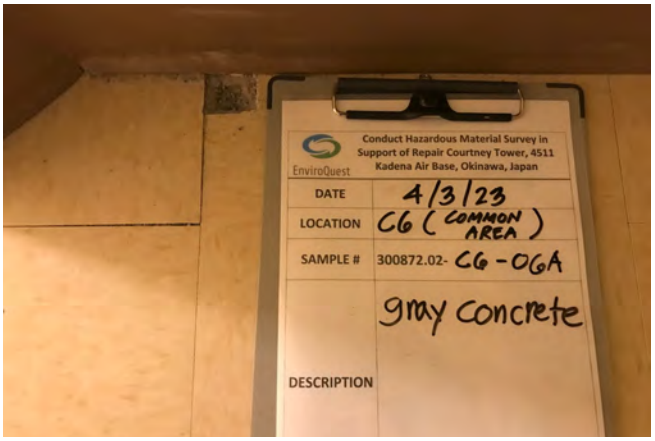

6th floor Common Area

Non asbestos containing 12”x12” tan vinyl floor tile with tan mastic over concrete coating.



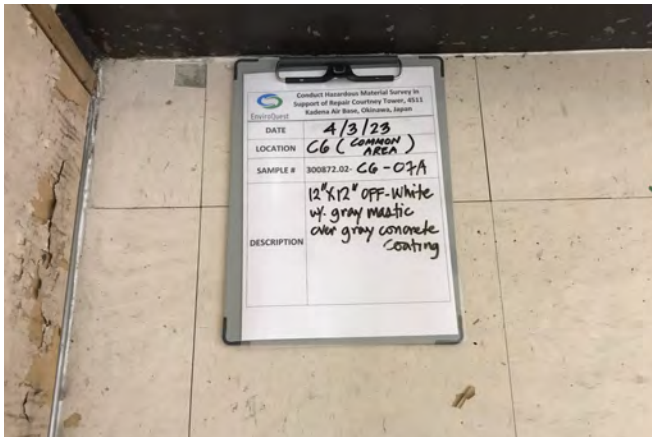

6th floor Common Area

Non asbestos containing gray concrete.




6th floor Common Area

Non asbestos containing gray concrete.

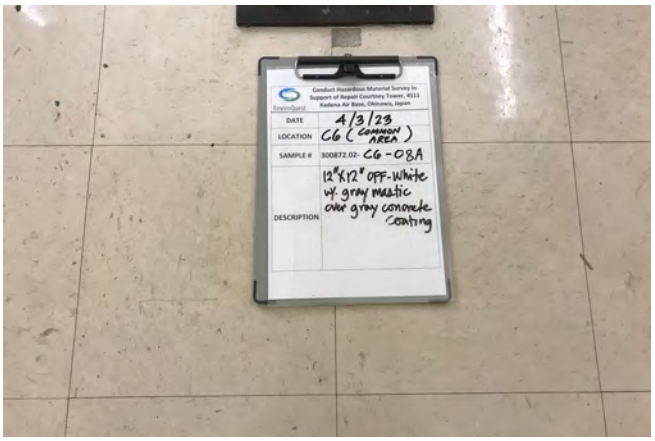



6th floor Common Area

Non asbestos containing 12”x12” off white with vinyl floor tile with gray mastic over gray concrete coating.

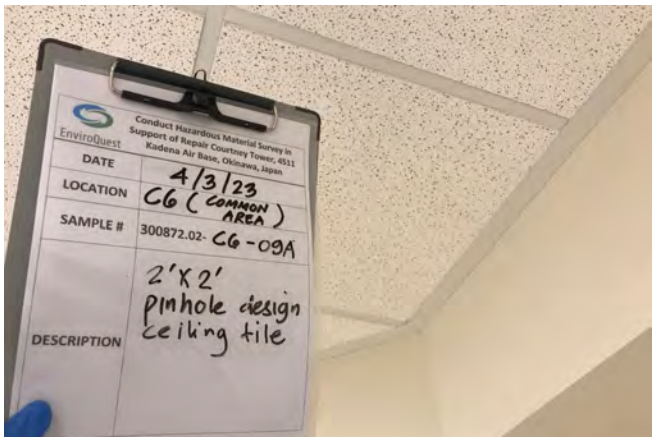
# REFERENCE PHOTOGRAPHS

EnviroQuest



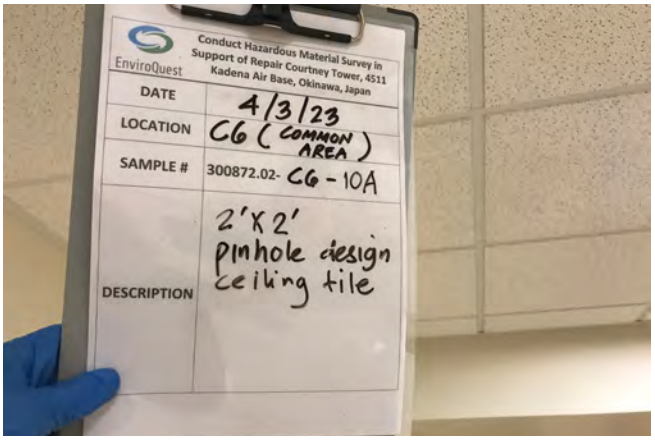

6th floor Common Area

Non asbestos containing 12”x12” off white vinyl floor tile with gray mastic over gray concrete coating.



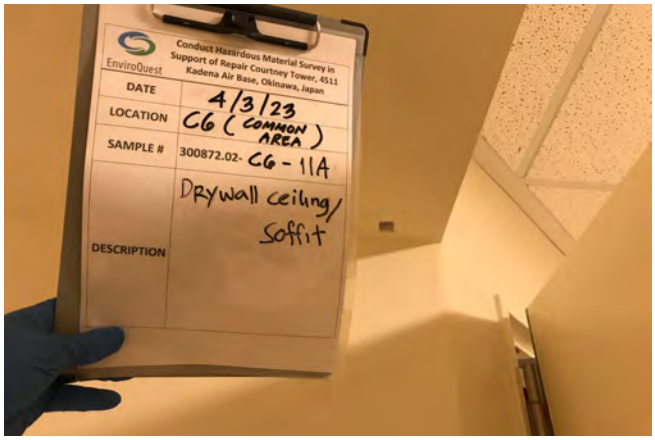

6th floor Common Area

Non asbestos containing 2’x2’ pinhole design ceiling tile.



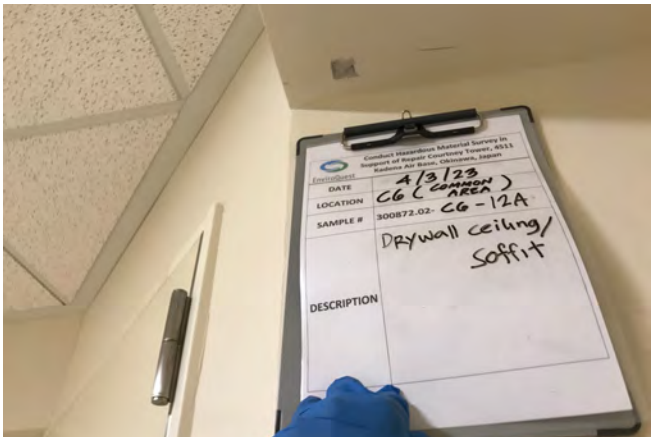

6th floor Common Area

Non asbestos containing 2’x2’ pinhole design ceiling tile.



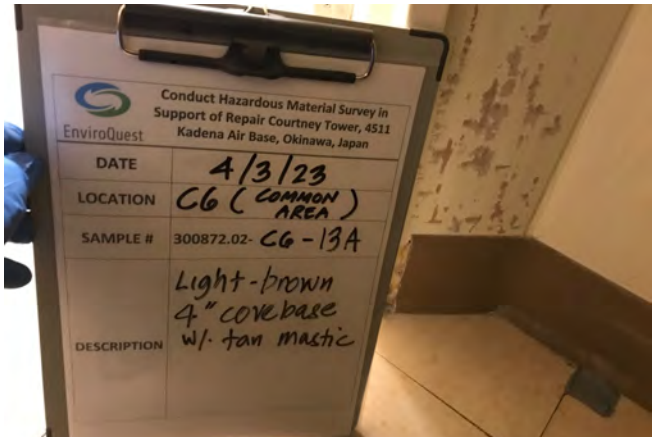

6th floor Common Area

Non asbestos containing drywall ceiling/soffit.




6th floor Common Area

Non asbestos containing drywall ceiling/soffit.

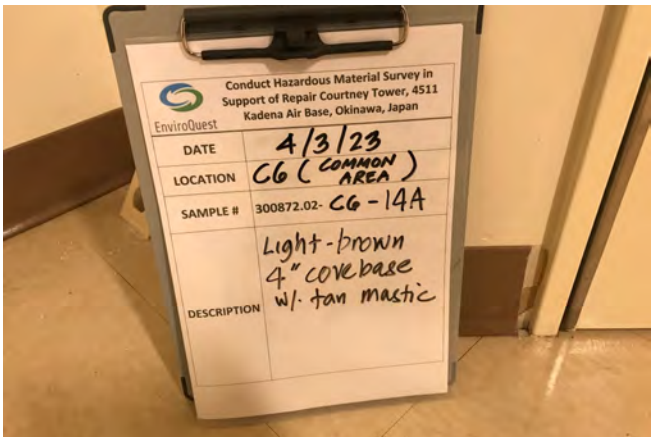



6th floor Common Area

Non asbestos containing light brown 4” covebase with tan mastic.

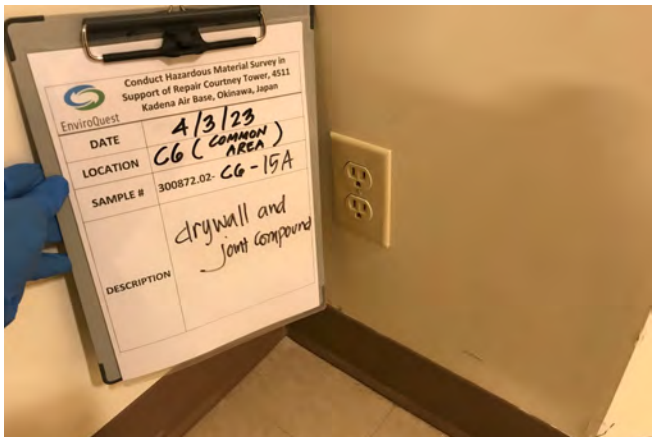
# REFERENCE PHOTOGRAPHS

EnviroQuest



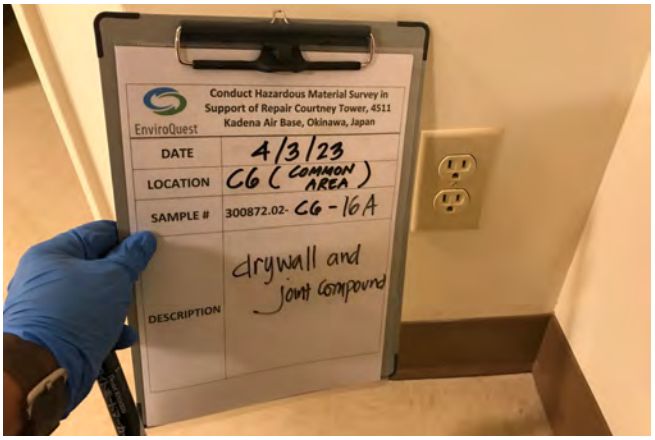

6th floor Common Area

Non asbestos containing light brown 4" covebase with tan mastic.




6th floor Common Area

Non asbestos containing drywall with joint compound.

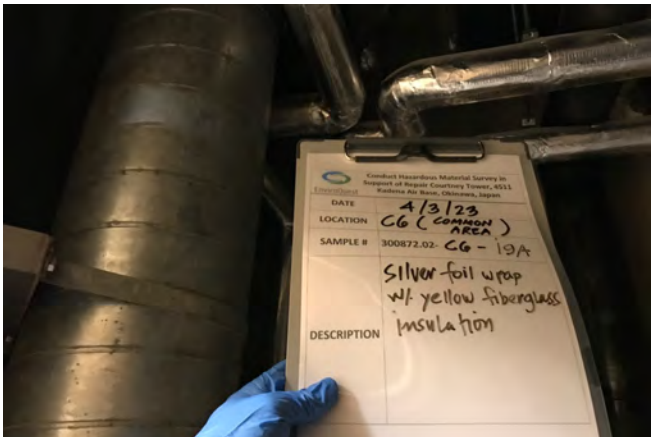



6th floor Common Area

Non asbestos containing drywall and joint compound.

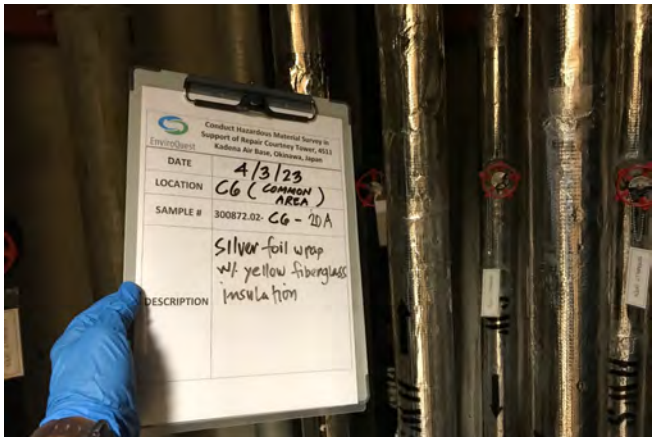
6th floor Common Area

Non asbestos containing tan gasket.




6th floor Common Area

Non asbestos containing silver foil wrap with yellow fiberglass insulation.




6th floor Common Area

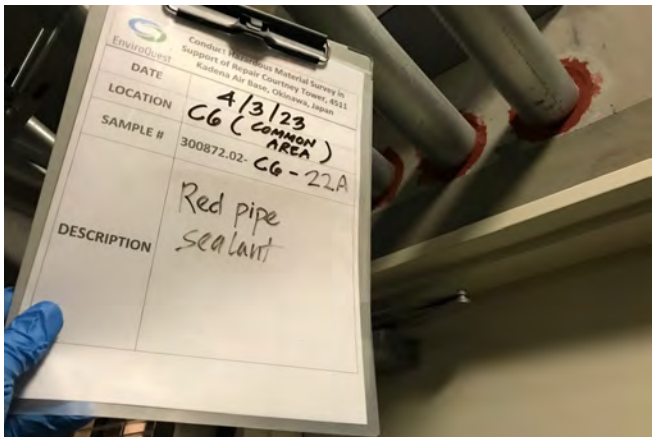
Non asbestos containing silver foil wrap with yellow fiberglass insulation.

# REFERENCE PHOTOGRAPHS

EnviroQuest

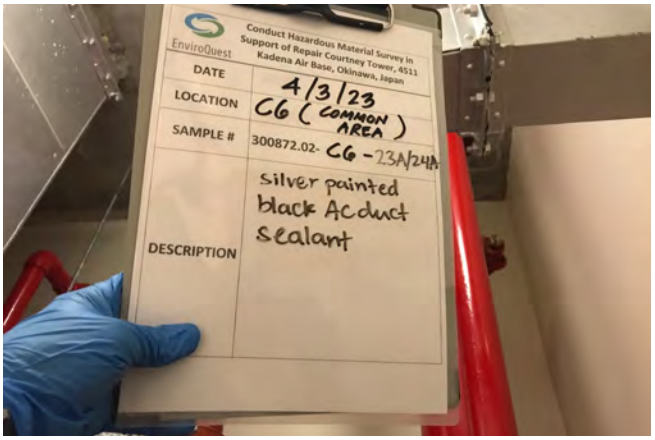
6th floor Common Area

Non asbestos containing red pipe sealant.



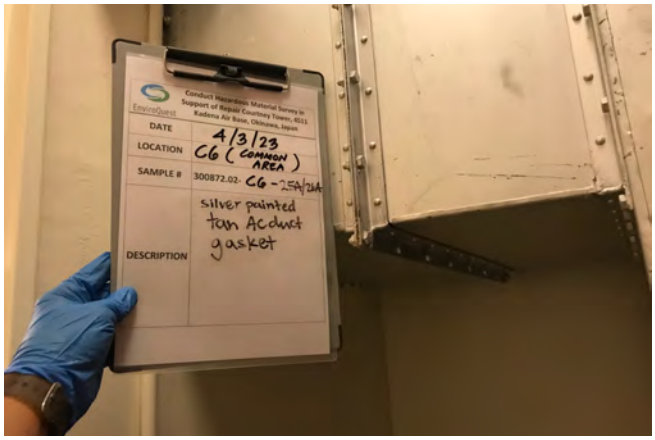

6th floor Common Area

Non asbestos containing red pipe sealant.



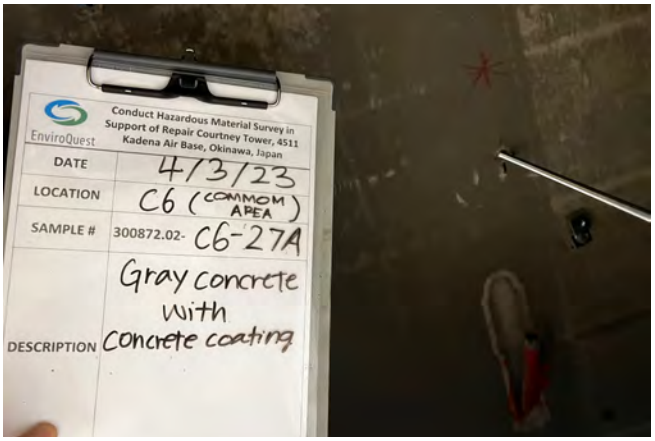

6th floor Common Area

Non asbestos containing silver painted black AC duct sealant.



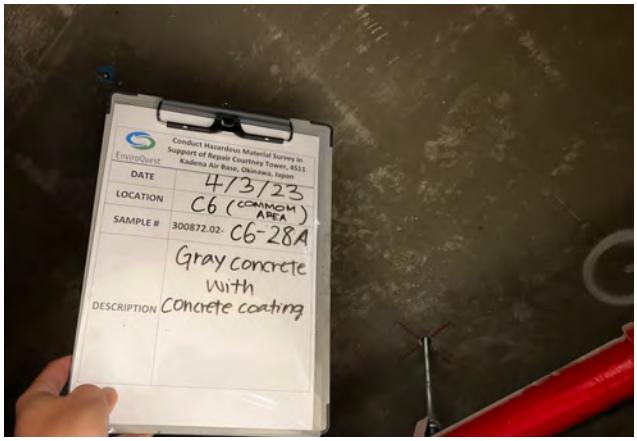

6th floor Common Area

Non asbestos containing silver painted tan AC duct gasket.




6th floor Common Area

Non asbestos containing gray concrete with concrete coating.

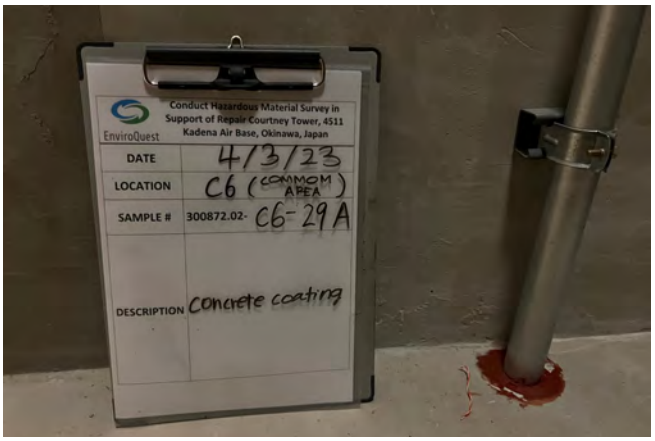



6th floor Common Area

Non asbestos containing gray concrete with concrete coating.

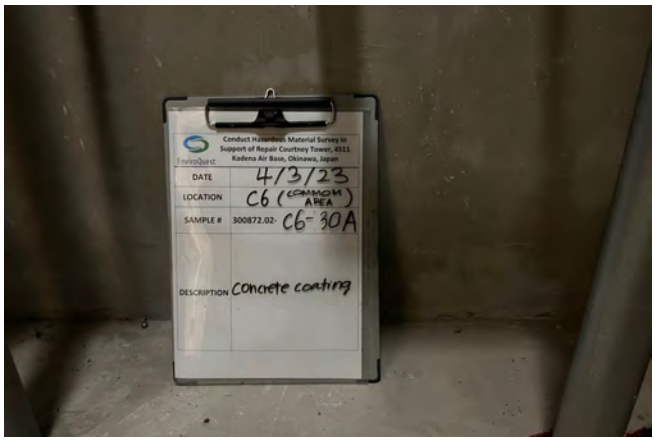
# REFERENCE PHOTOGRAPHS

EnviroQuest




6th floor Common Area

Non asbestos containing concrete coating.

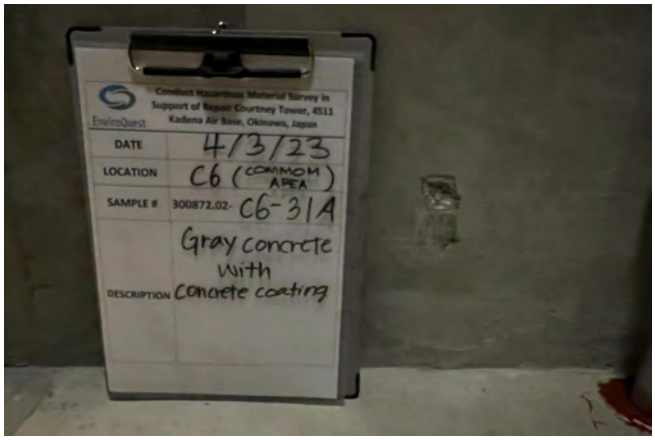



6th floor Common Area

Non asbestos containing concrete coating.

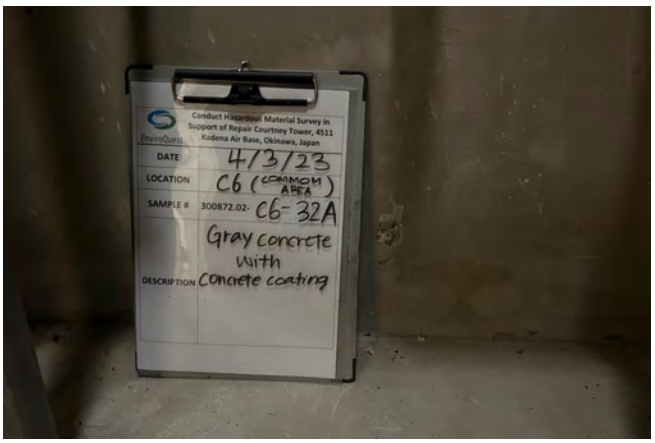
6th floor Common Area

Non asbestos containing concrete coating.



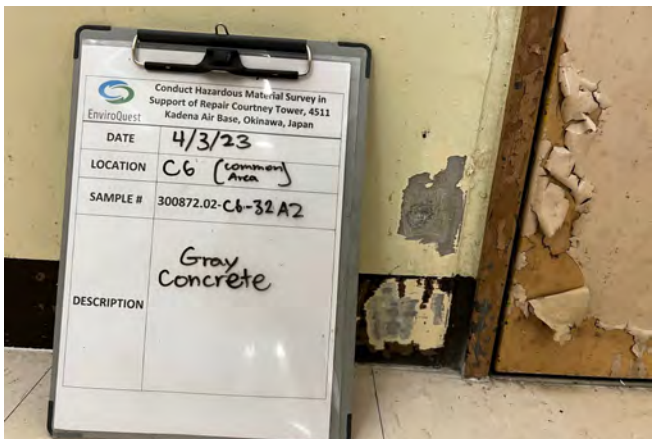

6th floor Common Area

Non asbestos containing gray concrete with concrete coating.




6th floor Common Area

Non asbestos containing gray concrete with concrete coating.

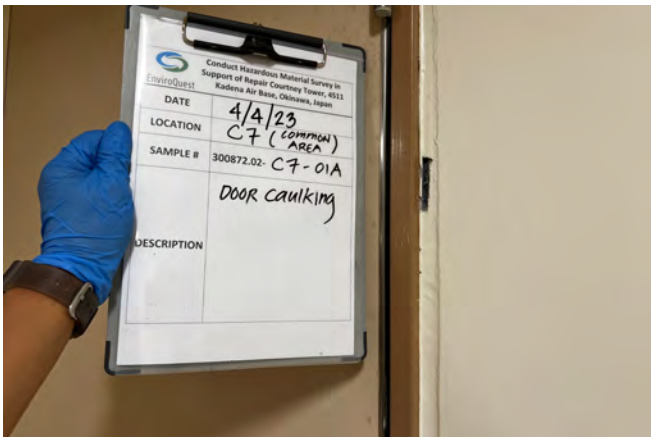



6th floor Common Area

Non asbestos containing gray concrete

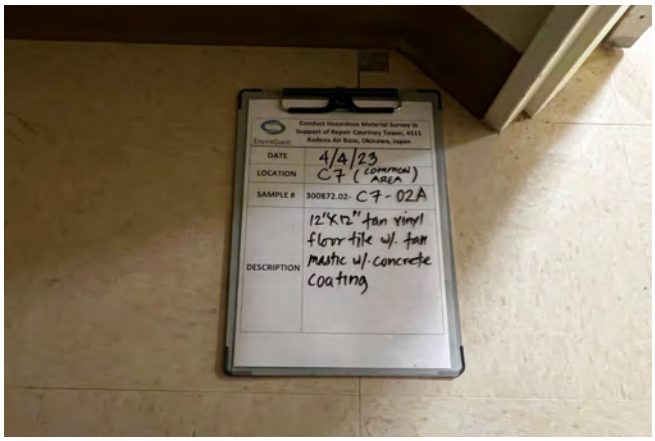
# REFERENCE PHOTOGRAPHS

EnviroQuest



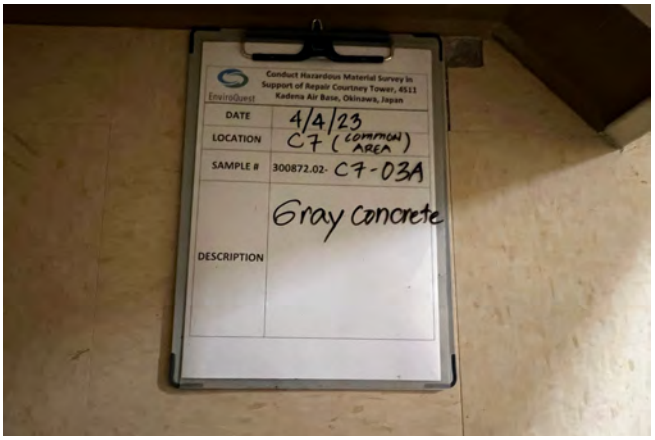

7th floor Common Area

Non asbestos containing door caulking.



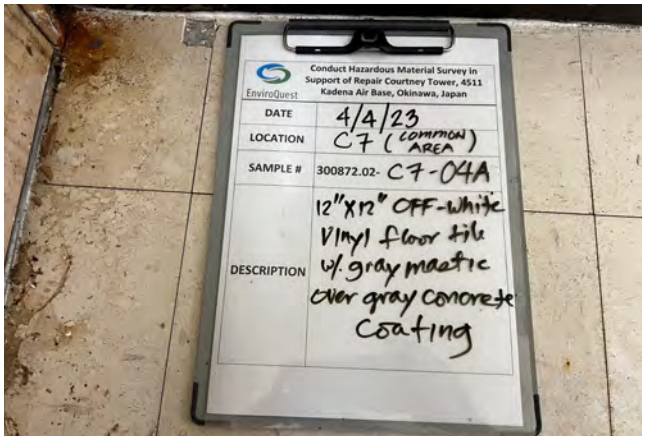

7th floor Common Area

Non asbestos containing 12”x12” tan vinyl floor tile with tan mastic and concrete coating.



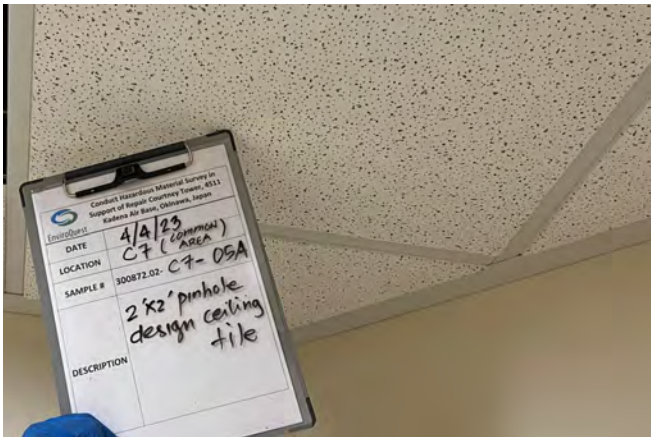

7th floor Common Area

Non asbestos containing gray concrete.



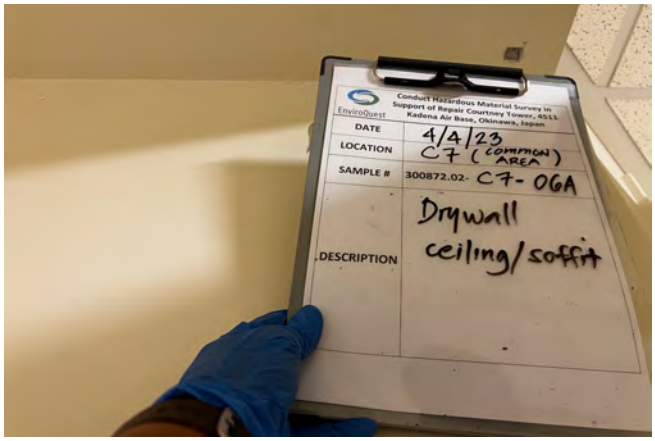

7th floor Common Area

Non asbestos containing 12”x12” off white vinyl floor tile with gray mastic over gray concrete coating.




7th floor Common Area

Non asbestos containing 2’x2’ pinhole design ceiling tile.

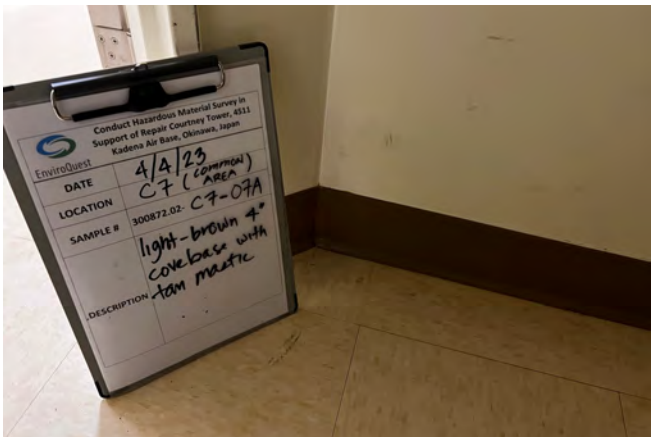



7th floor Common Area

Non asbestos containing drywall ceiling/soffit.

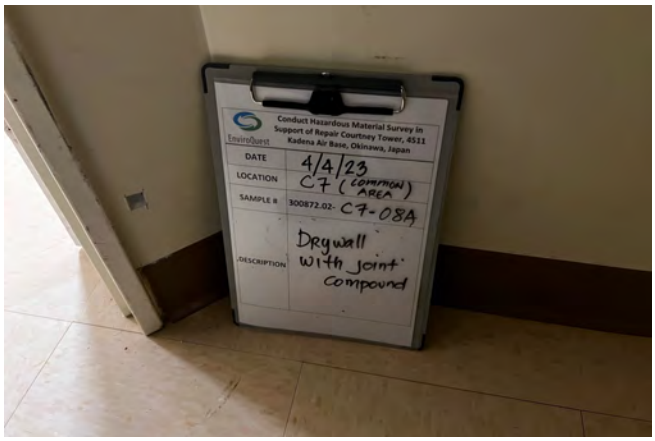
# REFERENCE PHOTOGRAPHS

EnviroQuest




7th floor Common Area

Non asbestos containing light brown 4” covebase with tan mastic.

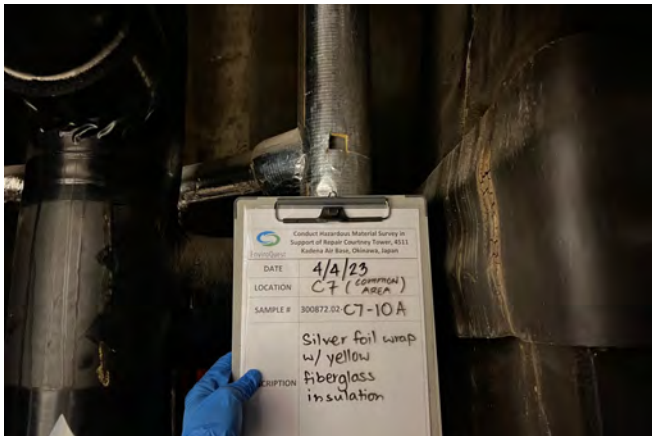



7th floor Common Area

Non asbestos containing drywall with joint compound.

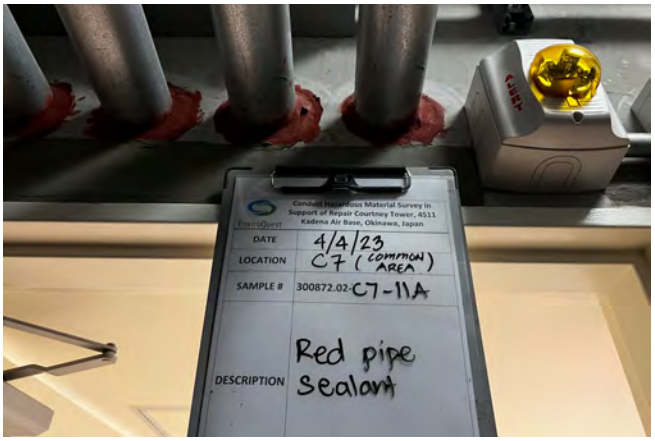
7th floor Common Area

Non asbestos containing tan gasket.



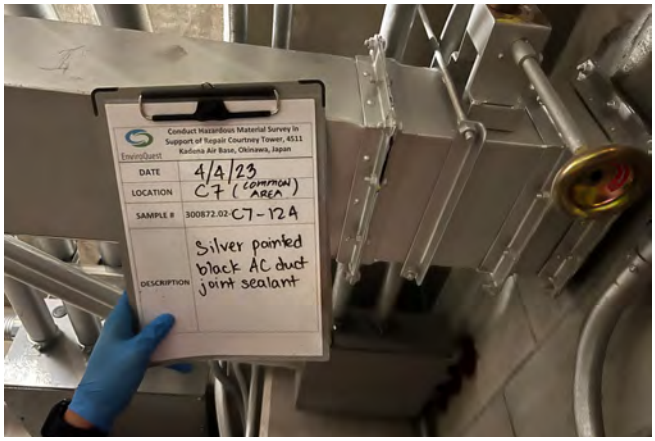

7th floor Common Area

Non asbestos containing silver foil wrap with yellow fiberglass insulation.




7th floor Common Area

Non asbestos containing red pipe sealant.




7th floor Common Area

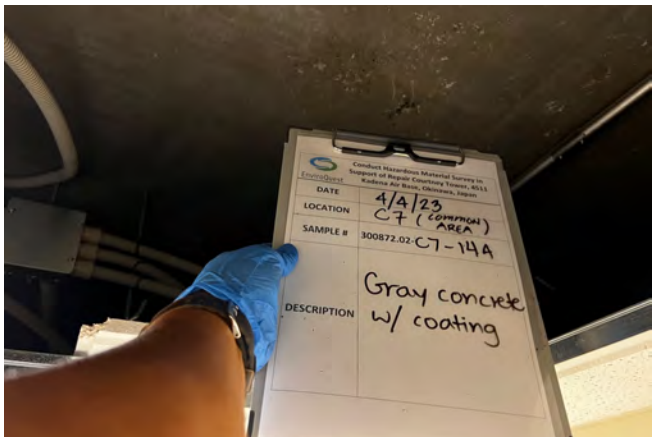
Non asbestos containing silver painted black AC duct joint sealant.

# REFERENCE PHOTOGRAPHS

EnviroQuest

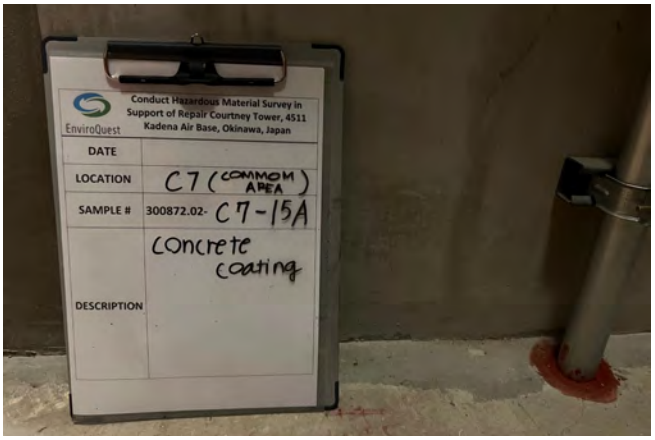
7th floor Common Area

Non asbestos containing silver painted tan AC duct joint gasket.



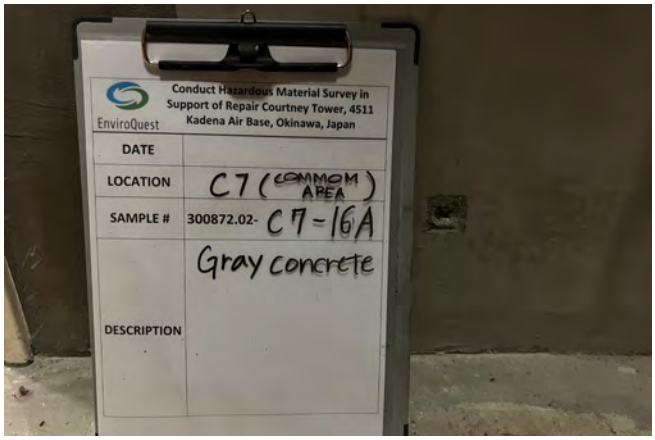

7th floor Common Area

Non asbestos containing gray concrete with coating.



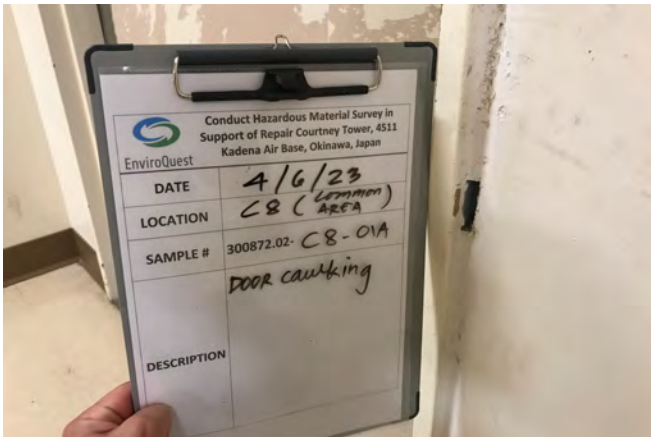

7th floor Common Area

Non asbestos containing concrete coating.



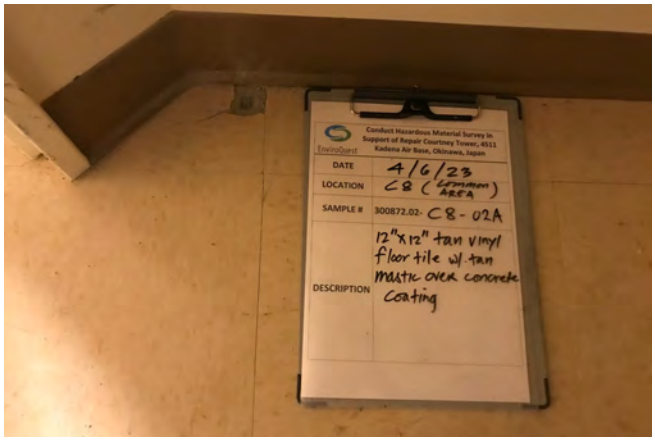

7th floor Common Area

Non asbestos containing gray concrete.




8th floor Common Area

Non asbestos containing door caulking.

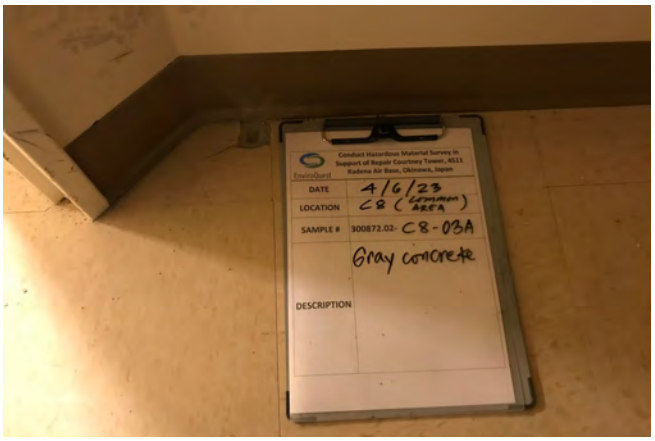



8th floor Common Area

Non asbestos containing 12”x12” tan vinyl floor tile with tan mastic over concrete coating.

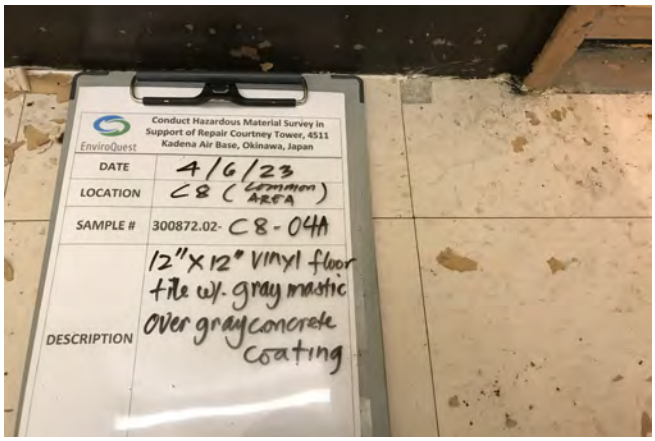
# REFERENCE PHOTOGRAPHS

EnviroQuest



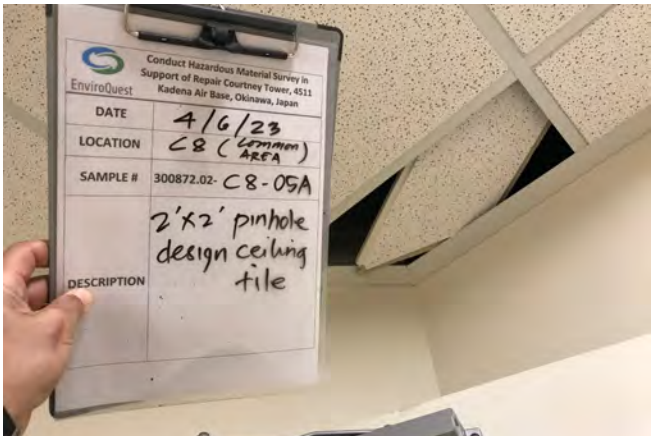

8th floor Common Area

Non asbestos containing gray concrete.



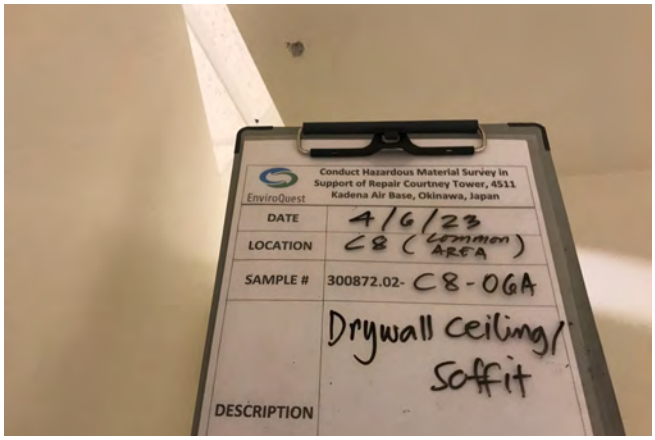

8th floor Common Area

Non asbestos containing 12”x12” vinyl floor tile with gray mastic over gray concrete coating.



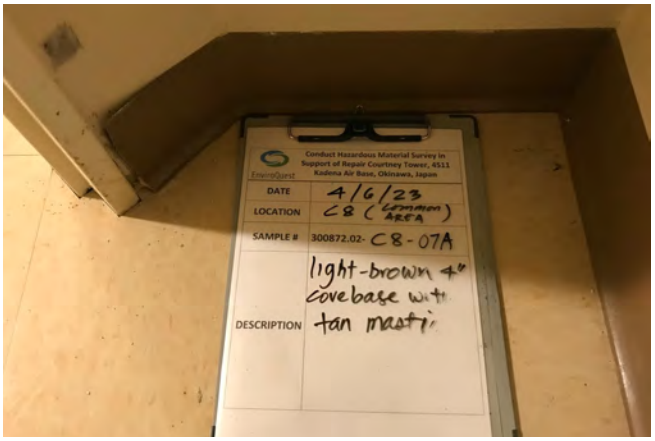

8th floor Common Area

Non asbestos containing 2’x2’ pinhole design ceiling tile.



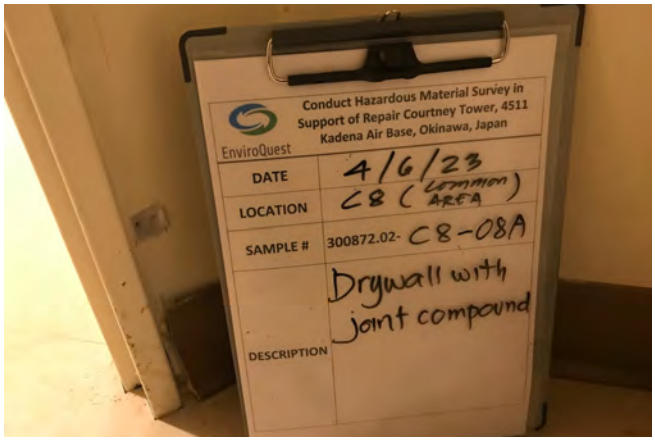

8th floor Common Area

Non asbestos containing drywall ceiling/soffit.




8th floor Common Area

Non asbestos containing light brown 4” covebase with tan mastic.

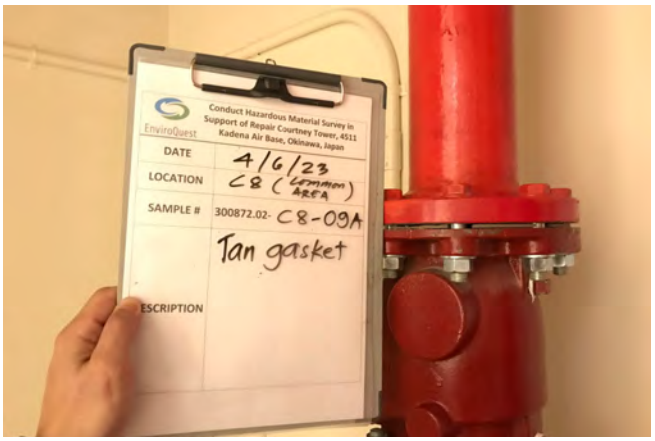



8th floor Common Area

Non asbestos containing drywall with joint compound.

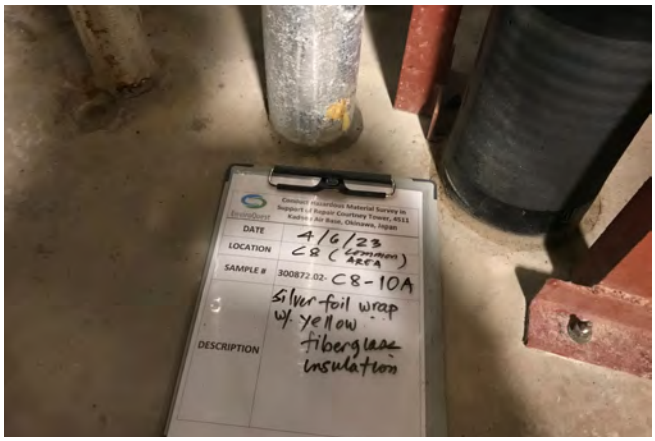
# REFERENCE PHOTOGRAPHS

EnviroQuest



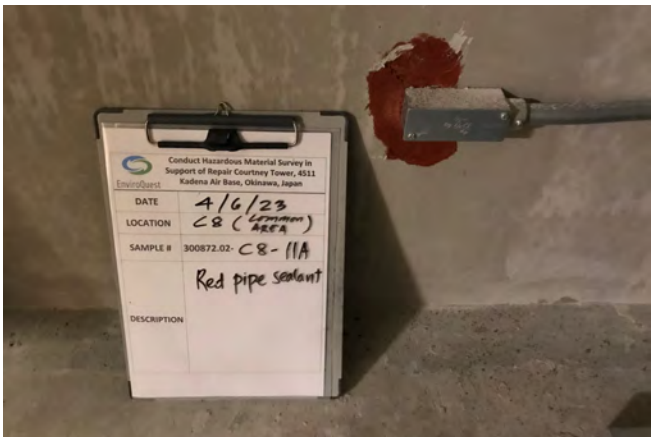

8th floor Common Area

Non asbestos containing tan gasket.



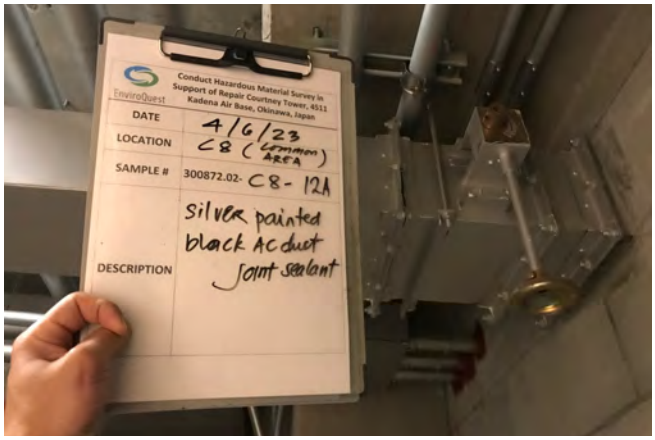

8th floor Common Area

Non asbestos containing silver foil wrap with yellow fiberglass insulation.



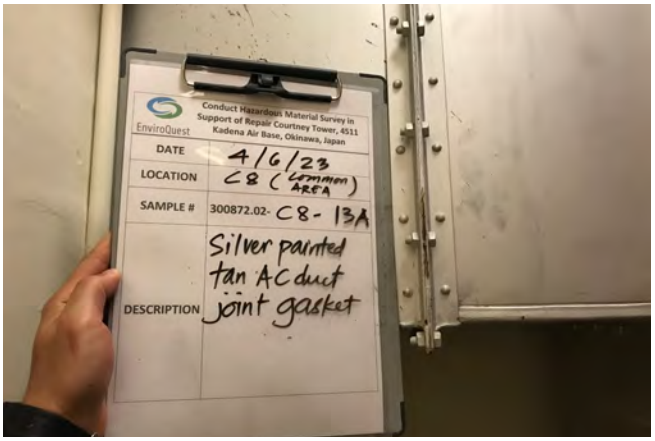

8th floor Common Area

Non asbestos containing red pipe sealant.



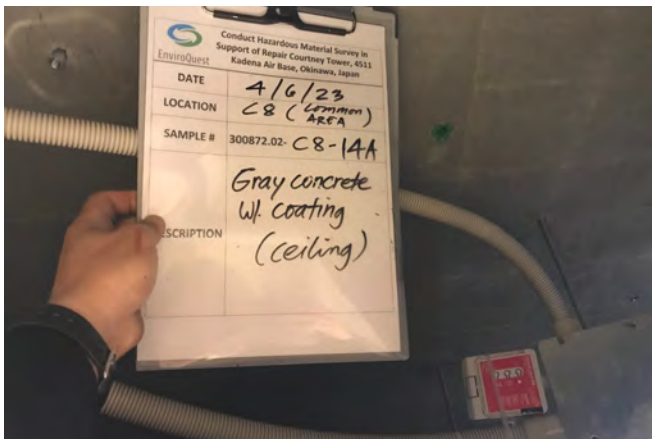

8th floor Common Area

Non asbestos containing silver painted black AC duct joint sealant.




8th floor Common Area

Non asbestos containing silver painted tan AC duct joint gasket.

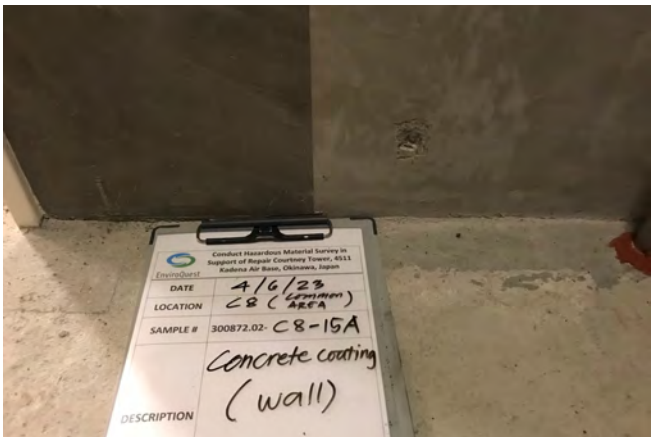



8th floor Common Area

Non asbestos containing gray concrete with coating.

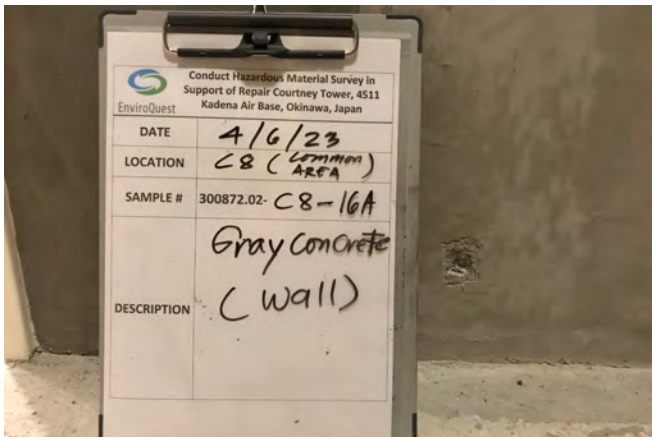
# REFERENCE PHOTOGRAPHS

EnviroQuest




8th floor Common Area

Non asbestos containing concrete coating.

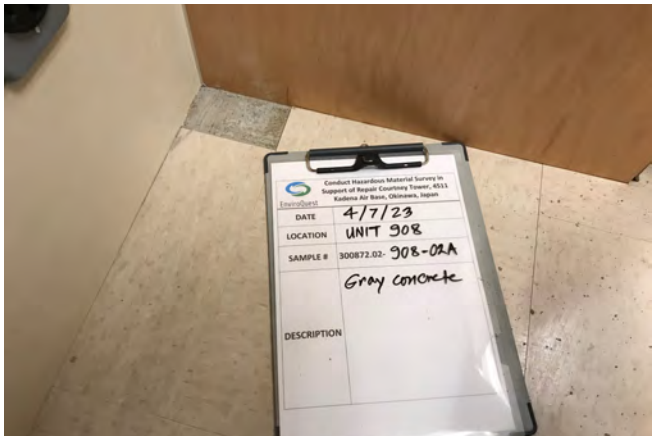



8th floor Common Area

Non asbestos containing gray concrete.

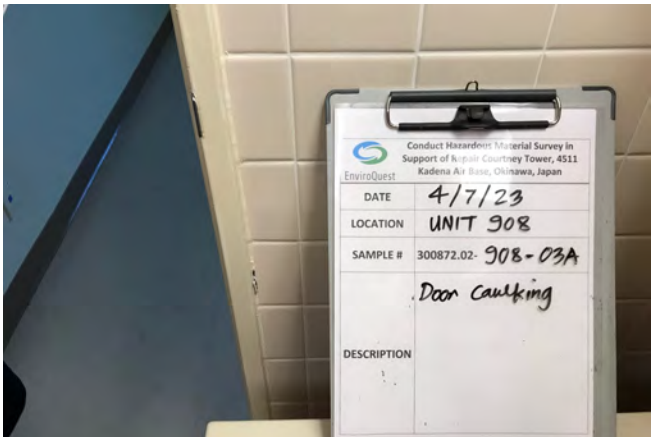
Unit 908

Non asbestos containing 12”x12” beige vinyl floor tile with tan mastic and gray coating.



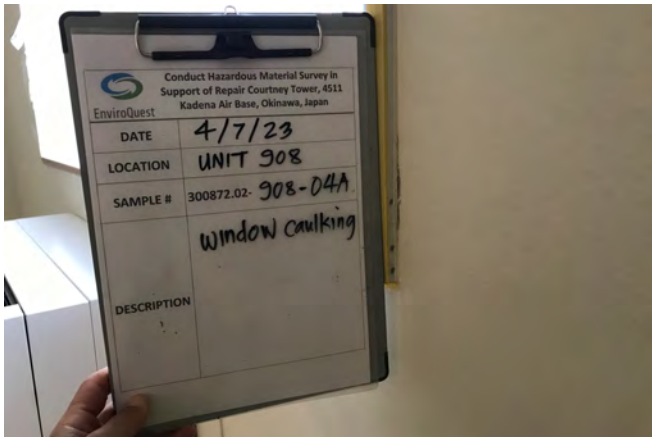

Unit 908

Non asbestos containing gray concrete.




Unit 908

Non asbestos containing door caulking.

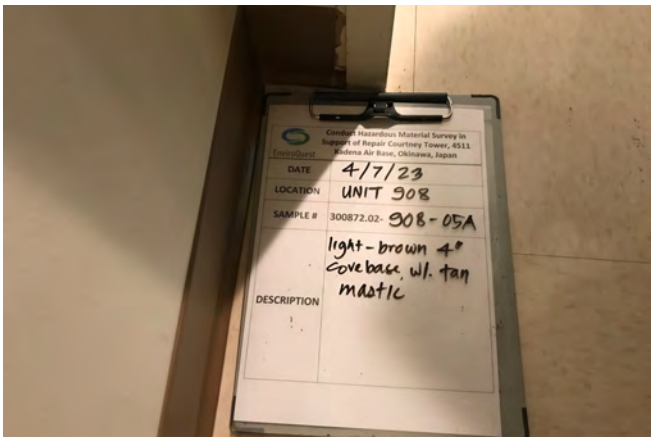



Unit 908

Non asbestos containing window caulking.

# REFERENCE PHOTOGRAPHS

EnviroQuest

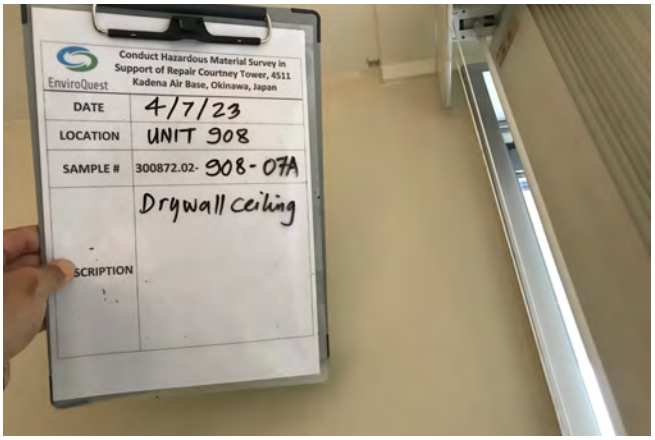



Unit 908

Non asbestos containing light brown 4” covebase with tan mastic.

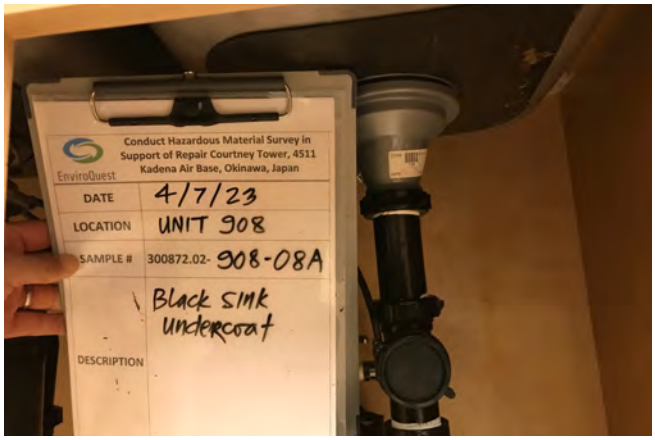
Unit 908

Non asbestos containing drywall with joint compound.



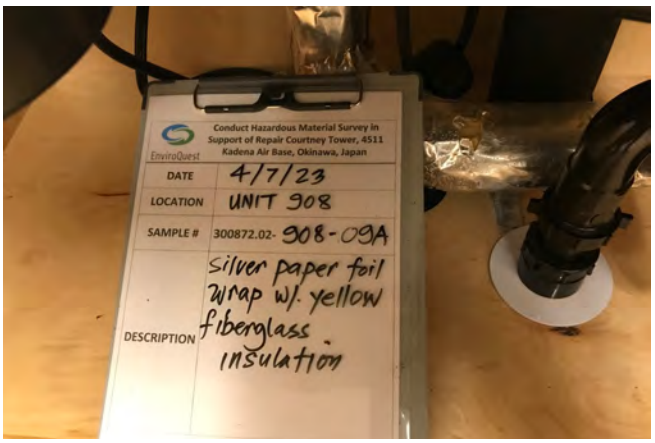

Unit 908

Non asbestos containing drywall ceiling.



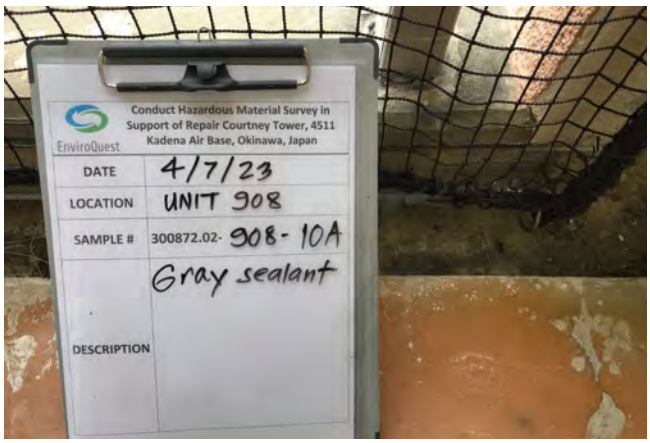

Unit 908

Non asbestos containing black sink undercoat.




Unit 908

Non asbestos containing silver paper foil wrap with yellow fiberglass insulation.

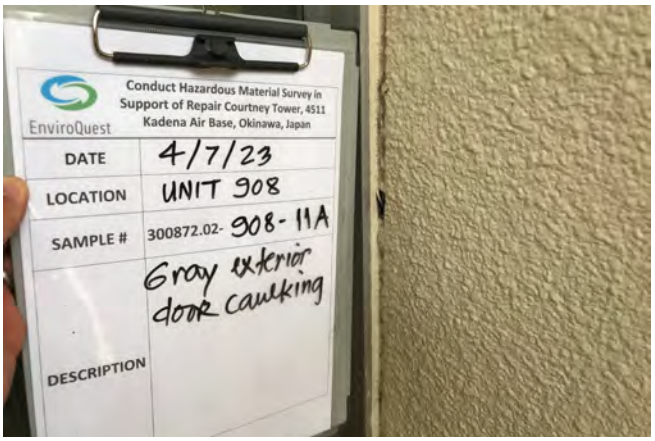



Unit 908

Non asbestos containing gray sealant.

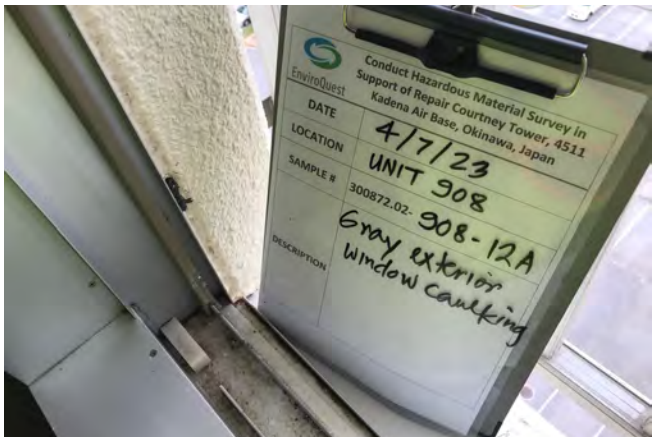
# REFERENCE PHOTOGRAPHS

EnviroQuest



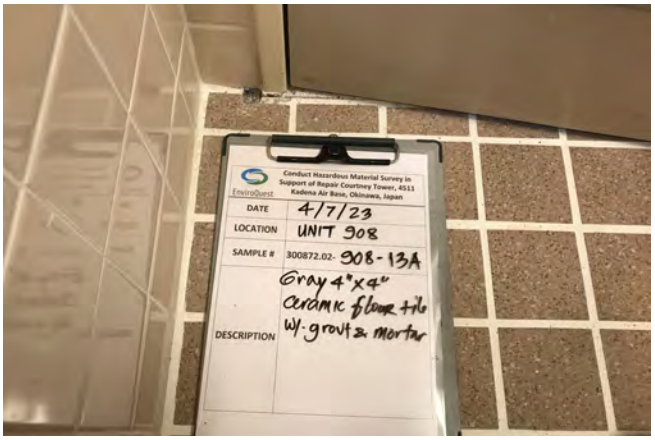

Unit 908

Non asbestos containing gray exterior door caulking.



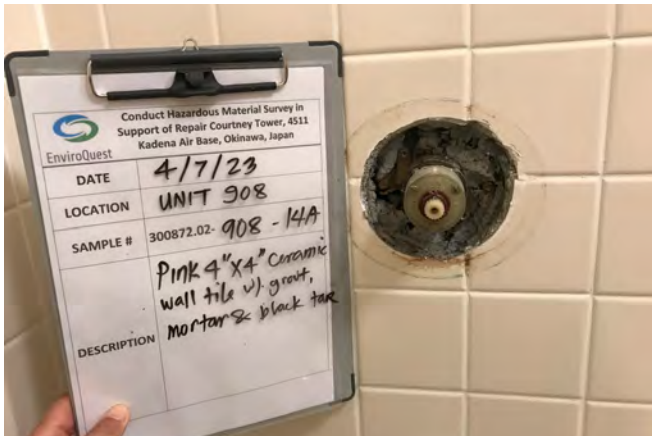

Unit 908

Non asbestos containing gray exterior window caulking.



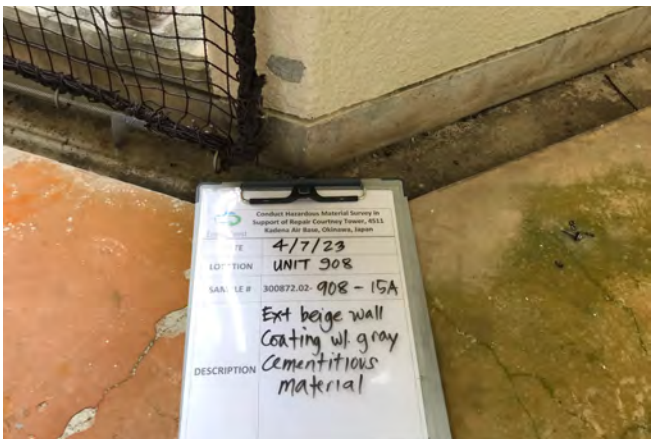

Unit 908

Non asbestos containing gray 4”x4” ceramic floor tile with grout and mortar.



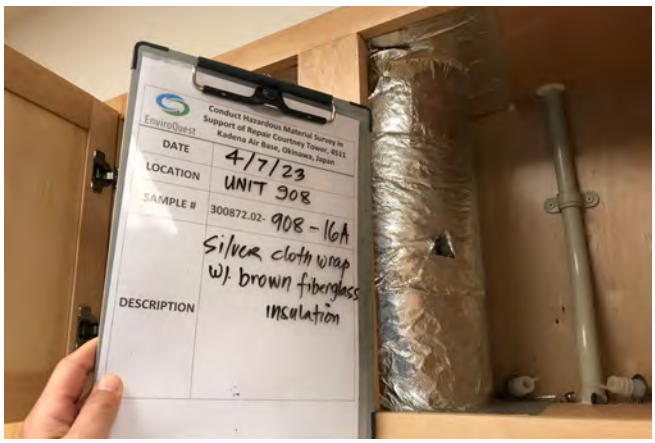

Unit 908

Non asbestos containing pink 4”x4” ceramic wall tile with grout, mortar and black tar.




Unit 908

Non asbestos containing exterior beige wall coating with gray cementitious material.

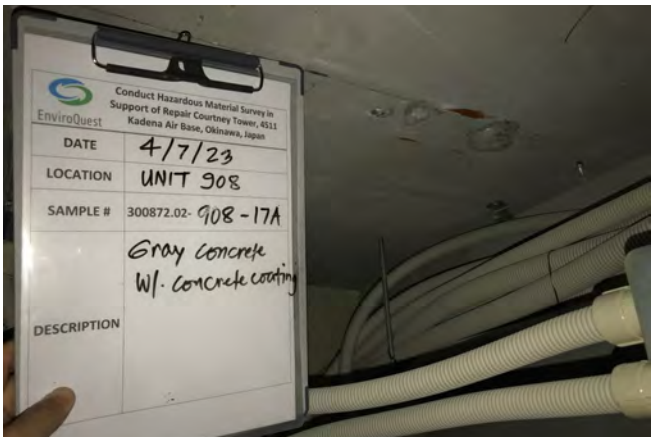



Unit 908

Non asbestos containing silver cloth wrap with brown fiberglass insulation.

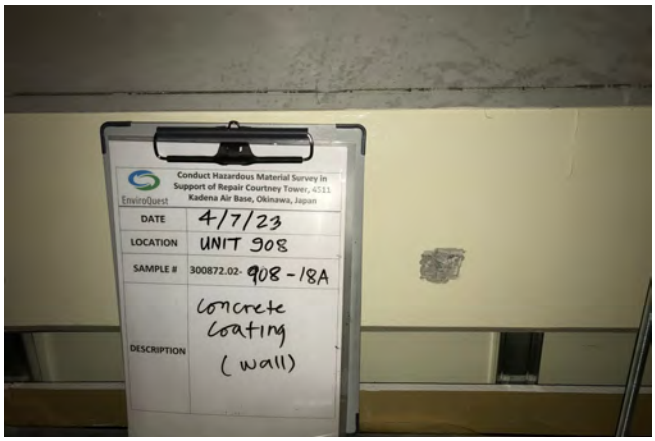
# REFERENCE PHOTOGRAPHS

EnviroQuest



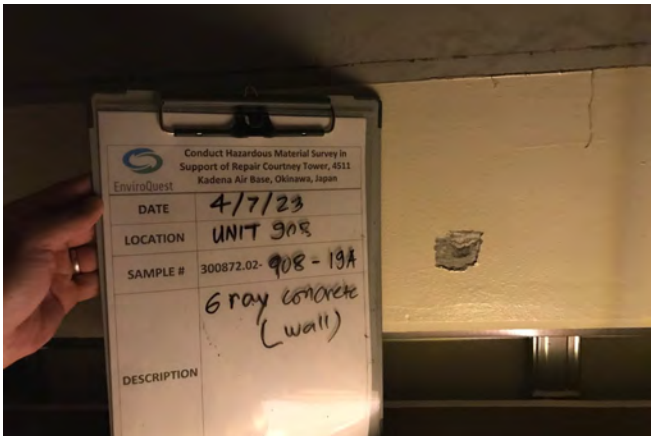

Unit 908

Non asbestos containing gray concrete with concrete coating.



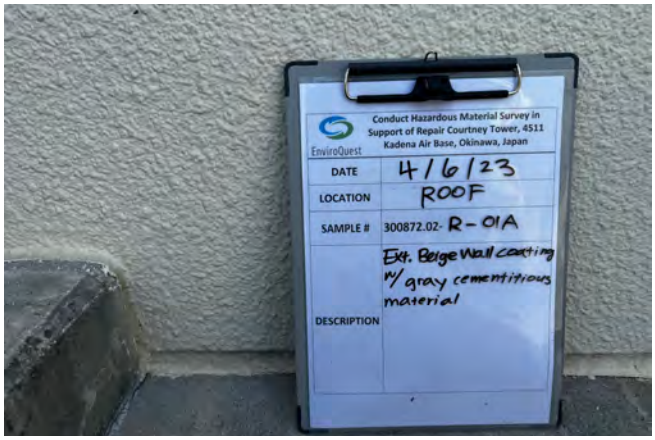

Unit 908

Non asbestos containing concrete coating.



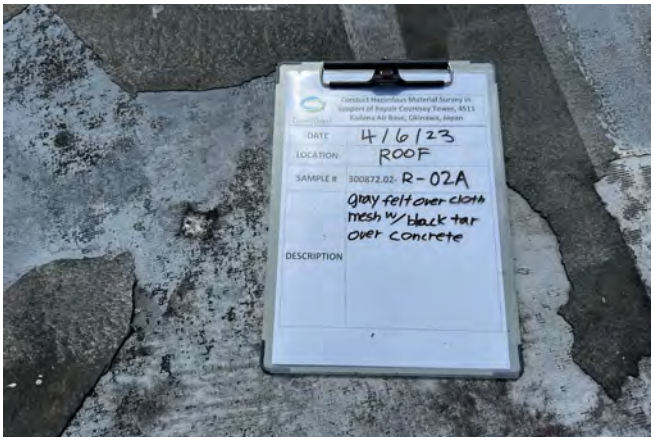

Unit 908

Non asbestos containing gray concrete.




Roof

Non asbestos containing exterior beige wall coating with gray cementitious material.




Roof

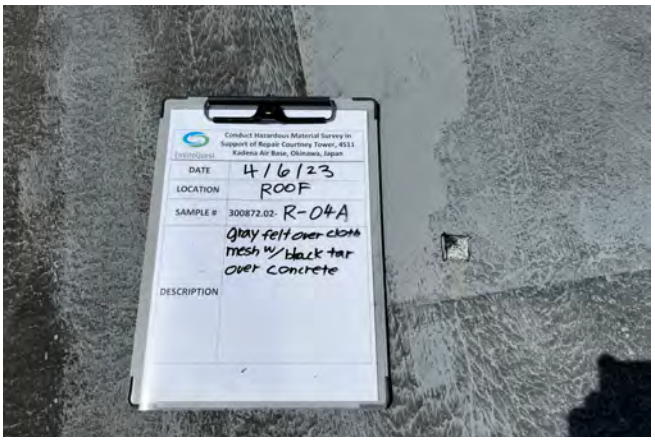
Non asbestos containing gray felt over cloth mesh with black tar over concrete.

Roof

Non asbestos containing gray felt over cloth mesh with black tar over concrete.

# REFERENCE PHOTOGRAPHS

EnviroQuest




Roof

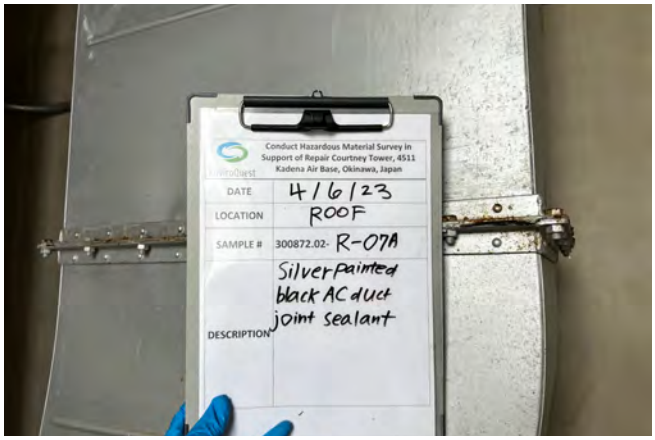
Non asbestos containing gray felt over cloth mesh with black tar over concrete.

Roof

Non asbestos containing gray felt over cloth mesh with black tar over concrete.

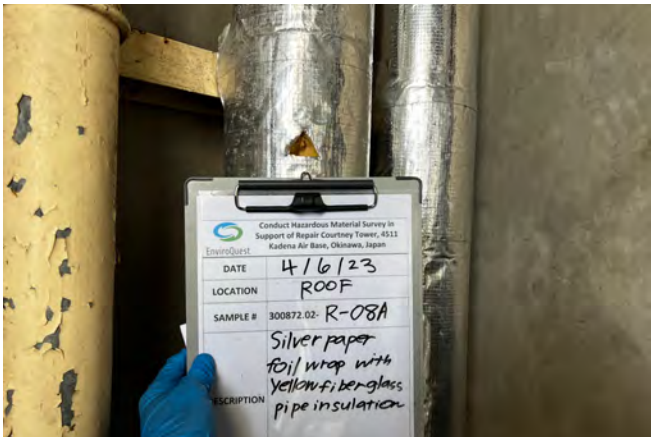
Roof

Non asbestos containing tan gasket.



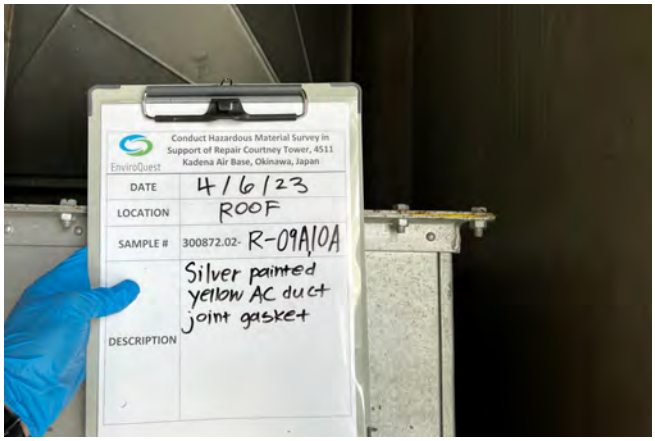

Roof

Non asbestos containing silver painted black AC duct joint sealant.




Roof

Non asbestos containing silver paper foil wrap with yellow fiberglass pipe insulation.

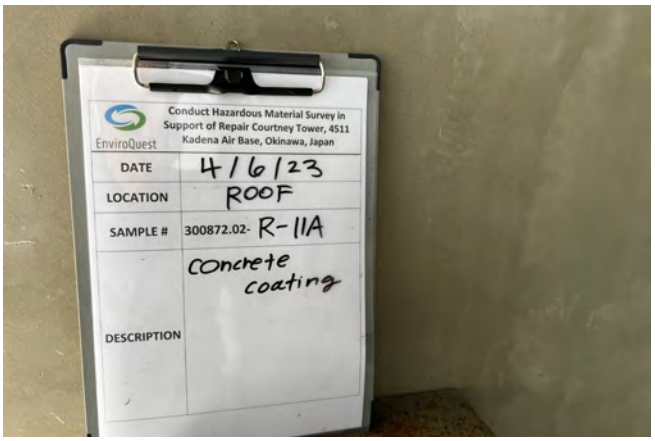



Roof

Non asbestos containing silver painted yellow AC duct joint gasket.

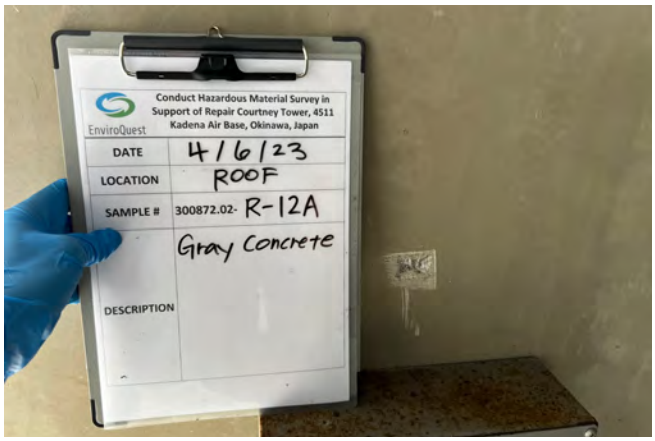
# REFERENCE PHOTOGRAPHS

EnviroQuest



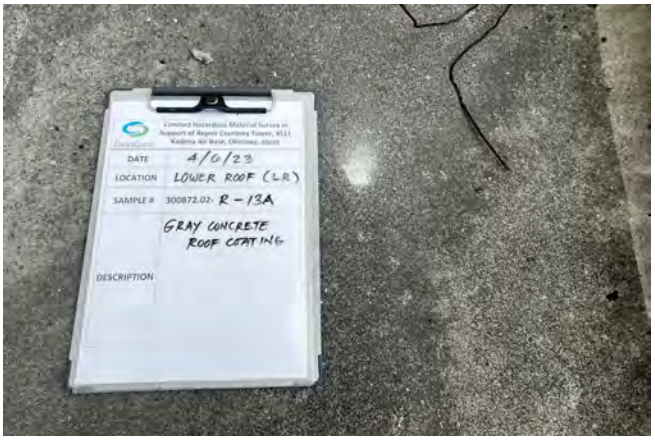

Roof

Non asbestos containing concrete coating.




Roof

Non asbestos containing gray concrete.




Lower Roof

Non asbestos containing gray concrete roof coating.

Lower Roof

Non asbestos containing gray concrete roof coating.

Lower Roof

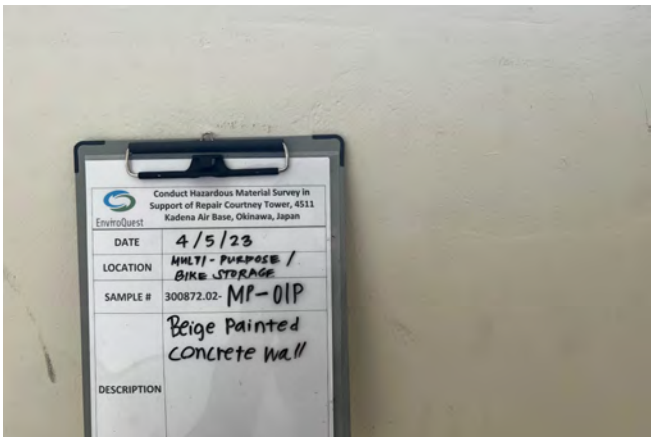
Non asbestos containing beige roof tile grout.

Lower Roof

Non asbestos containing beige roof tile grout.

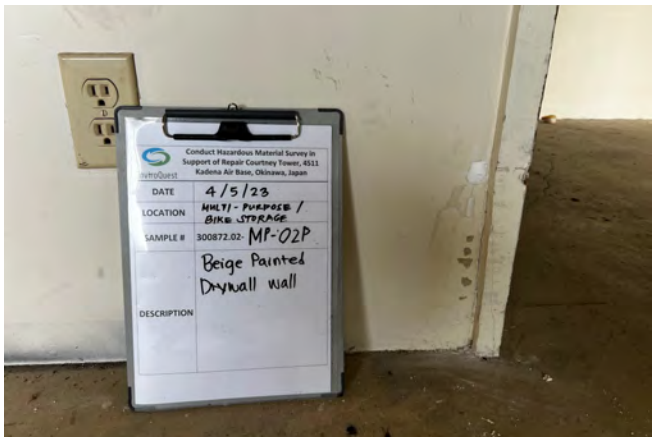
# REFERENCE PHOTOGRAPHS

EnviroQuest



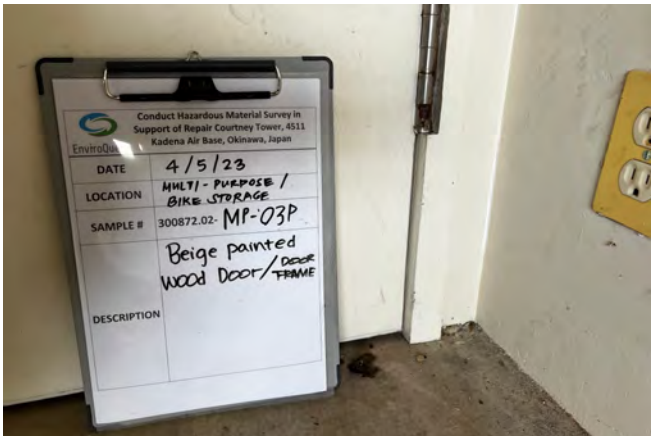

Multi Purpose/Bike Storage

Non lead, cadmium and chromium containing beige painted concrete wall.



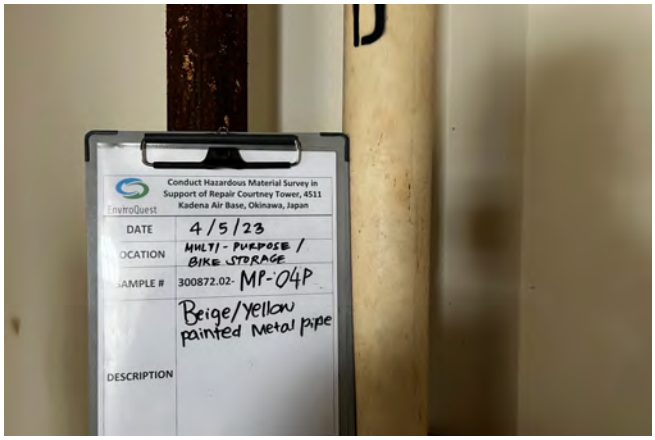

Multi Purpose/Bike Storage

Non lead, cadmium and chromium containing beige painted drywall wall.




Multi Purpose/Bike Storage

Non lead, cadmium and chromium containing beige painted wood door and door frame.




Multi Purpose/Bike Storage

Lead, cadmium and chromium containing beige over yellow painted metal pipe.

Multi Purpose/Bike Storage

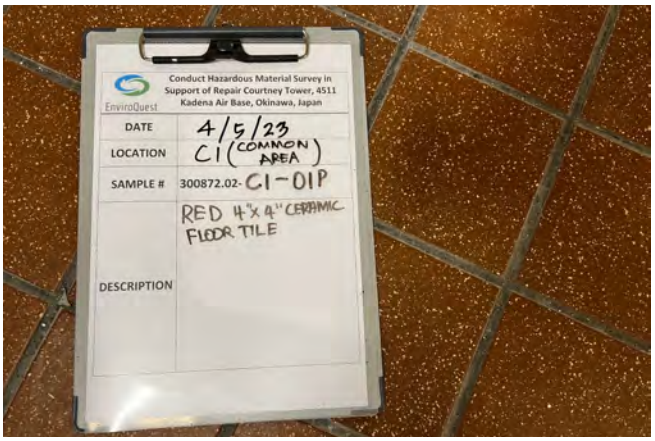
Lead containing red painted metal fire suppression pipe.

Multi Purpose/Bike Storage

Non lead, cadmium and chromium containing beige painted concrete wall.

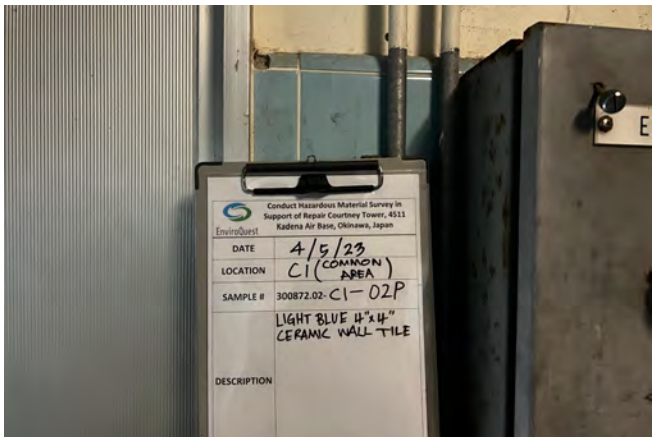
# REFERENCE PHOTOGRAPHS

EnviroQuest



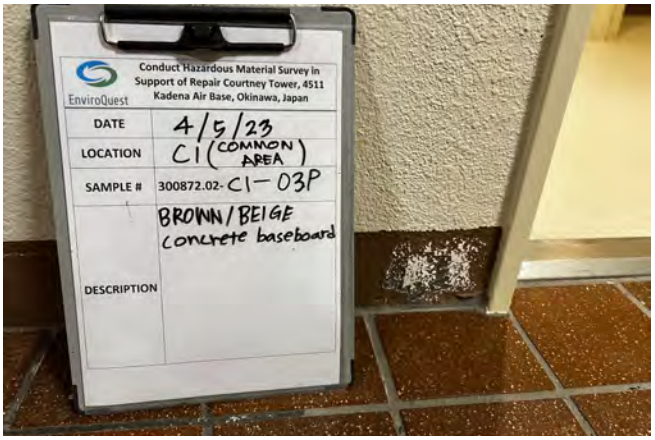

1st floor Common Area

Non lead, cadmium and chromium containing red glazed ceramic floor.




1st floor Common Area

Non lead, cadmium and chromium containing glazed light blue ceramic wall tile.

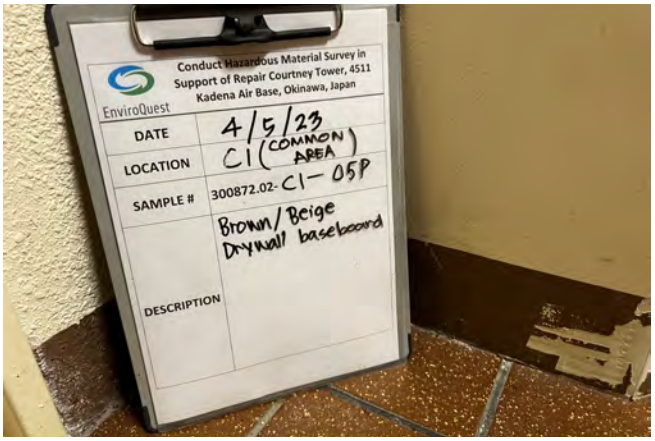



1st floor Common Area

Lead and chromium containing brown over beige painted concrete baseboard.

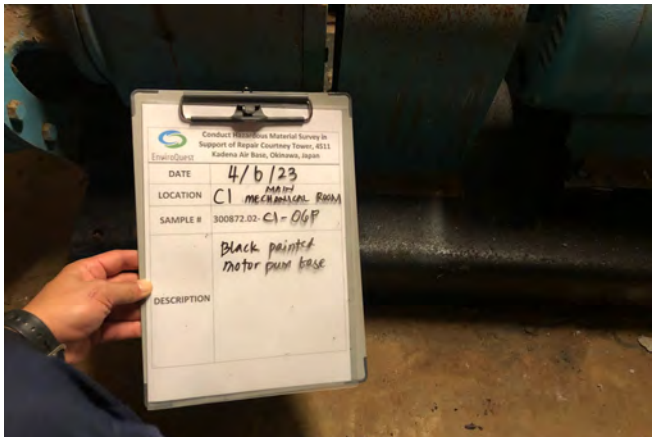
1st floor Common Area

Non lead cadmium and chromium containing beige painted concrete wall.




1st floor Common Area

Non lead, cadmium and chromium containing brown over beige painted drywall baseboard.

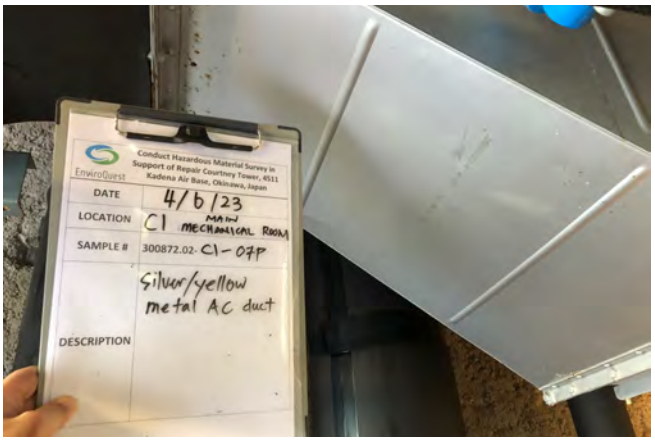



1st floor Common Area Main Mechanical Room

Non lead, cadmium and chromium containing black painted metal motor pump base frame.

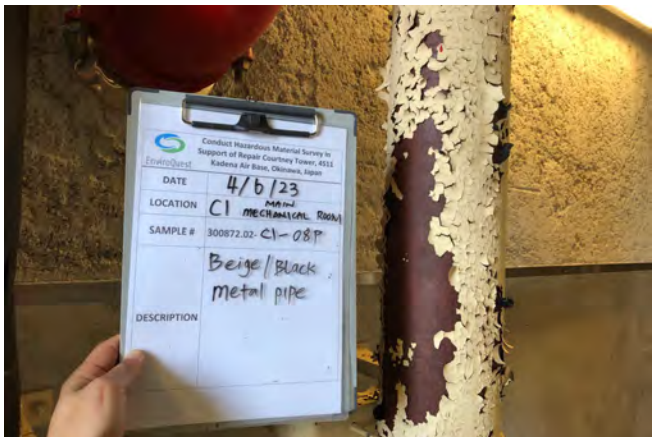
# REFERENCE PHOTOGRAPHS

EnviroQuest




1st floor Common Area Main Mechanical Room

Lead, cadmium and chromium containing silver over yellow painted metal AC duct.




1st floor Common Area Main Mechanical Room

Lead containing beige over black painted metal pipe.

1st floor Common Area Main Mechanical Room

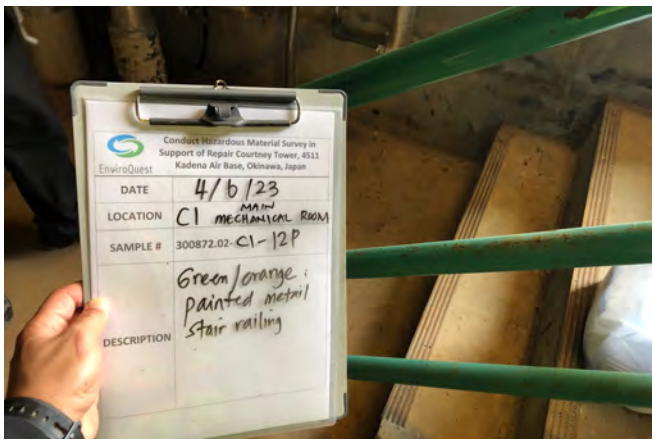
Lead and chromium containing gray painted metal support frame.

1st floor Common Area Main Mechanical Room

Non lead, cadmium and chromium containing blue painted metal motor pump.

1st floor Common Area Main Mechanical Room

Non lead, cadmium and chromium containing green painted metal motor pump.

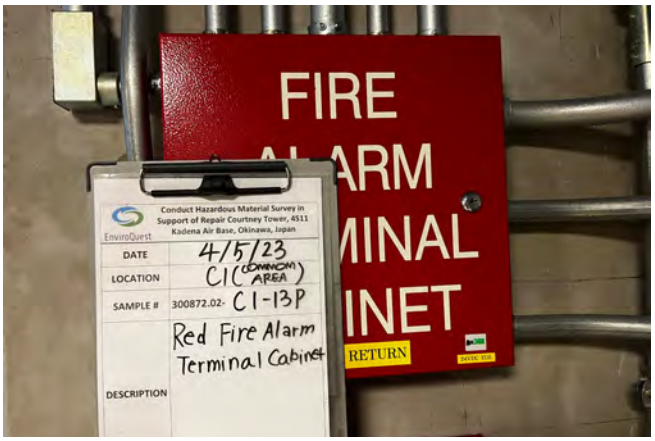



1st floor Common Area Main Mechanical Room

Lead based and chromium containing green over orange painted metal stair railing.

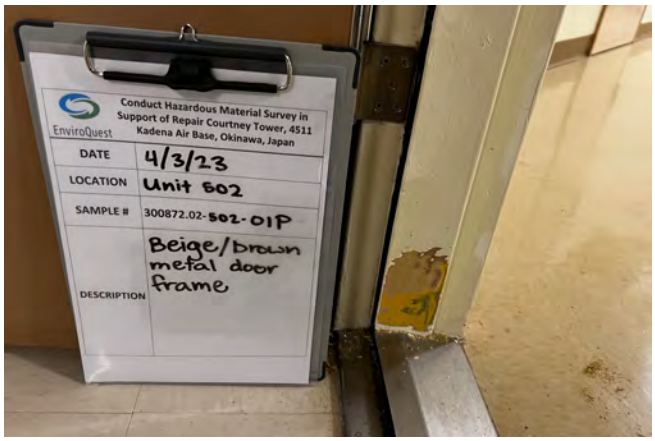
# REFERENCE PHOTOGRAPHS

EnviroQuest



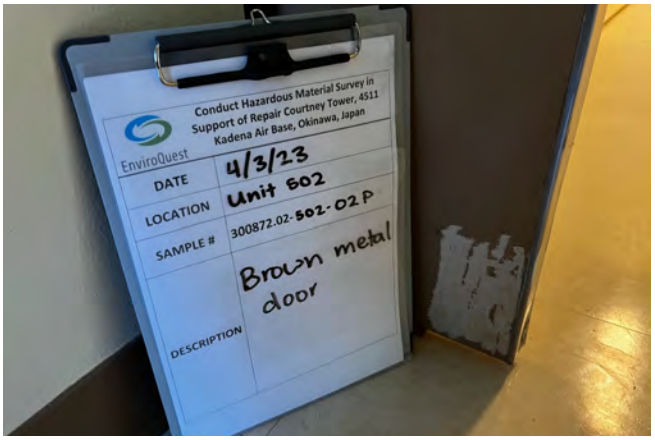

1st floor Common Area Main Mechanical Room

Non lead, cadmium and chromium containing red painted fire alarm terminal cabinet.



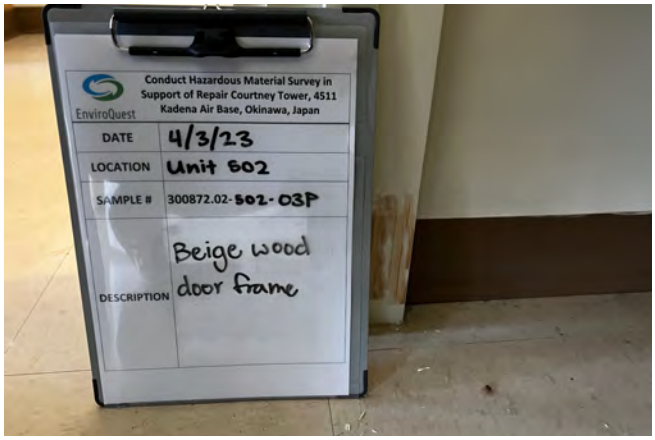

Unit 502

Lead based, cadmium and chromium containing beige over brown painted metal door frame.



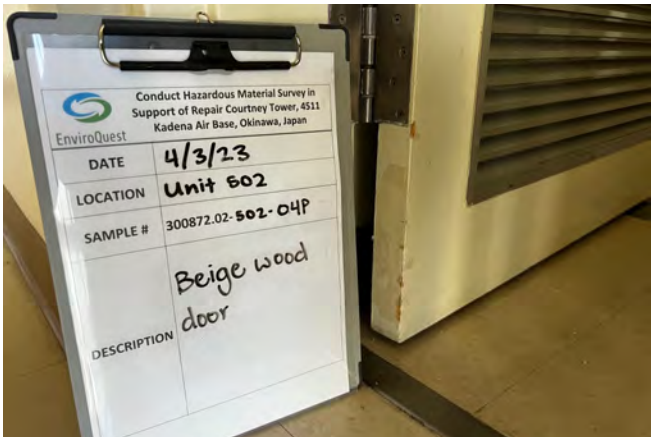

Unit 502

Lead and chromium containing brown painted metal door.



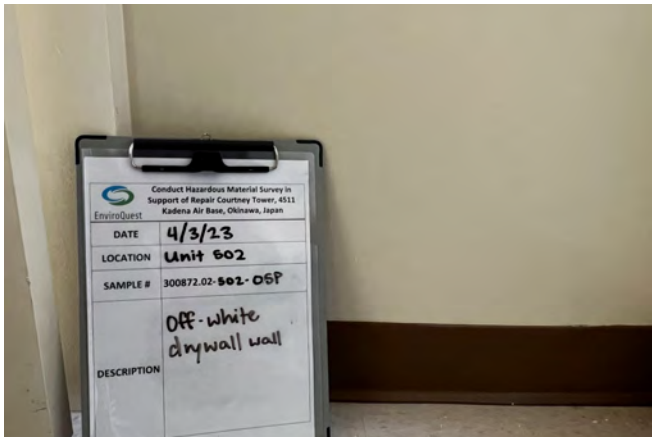

Unit 502

Lead containing beige painted wood door frame.




Unit 502

Lead containing beige painted wood door.

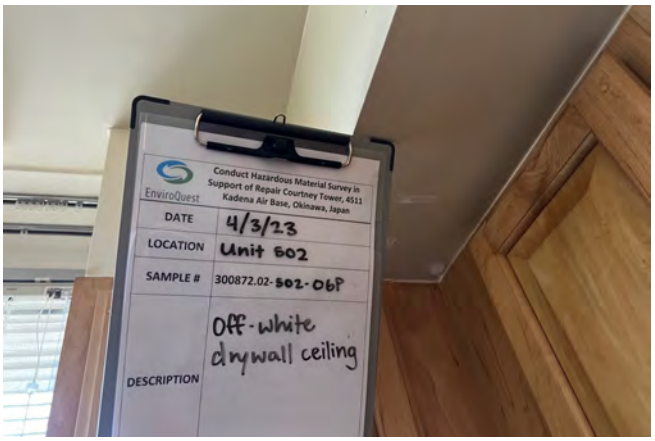



Unit 502

Non lead, cadmium and chromium containing off white painted drywall wall.

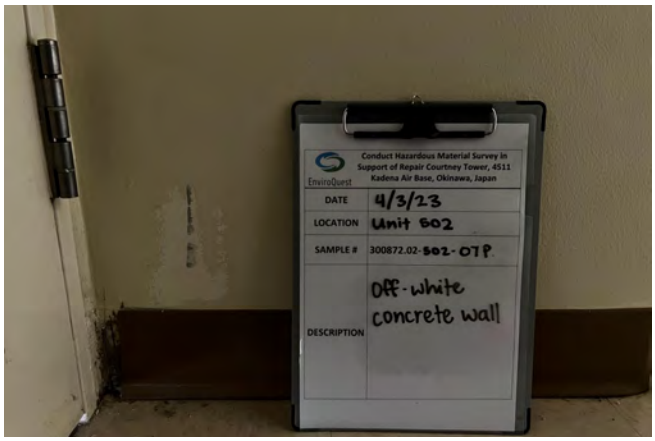
# REFERENCE PHOTOGRAPHS

EnviroQuest



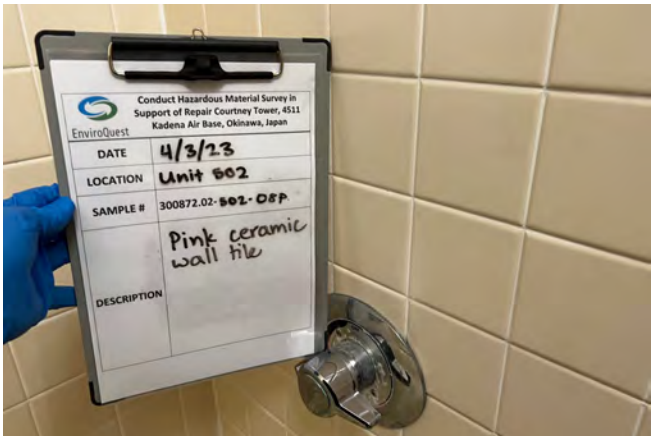

Unit 502

Non lead, cadmium and chromium containing off white painted drywall ceiling.




Unit 502

Non lead, cadmium and chromium containing off white painted concrete wall.

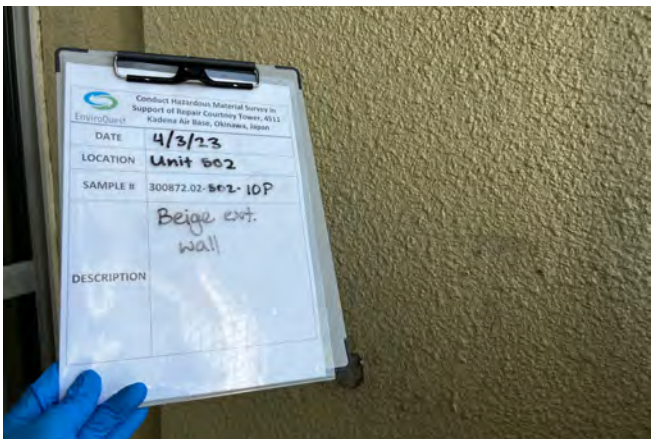



Unit 502

Non lead, cadmium and chromium containing pink ceramic wall tile.

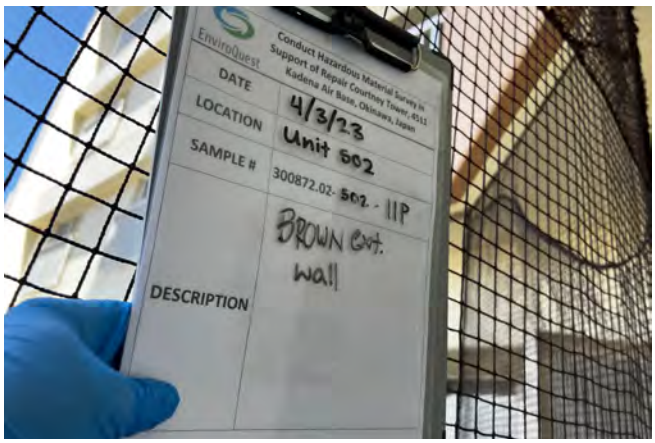
Unit 502

Non lead, cadmium and chromium containing gray ceramic floor tile.




Unit 502

Non lead, cadmium and chromium containing beige painted concrete wall.

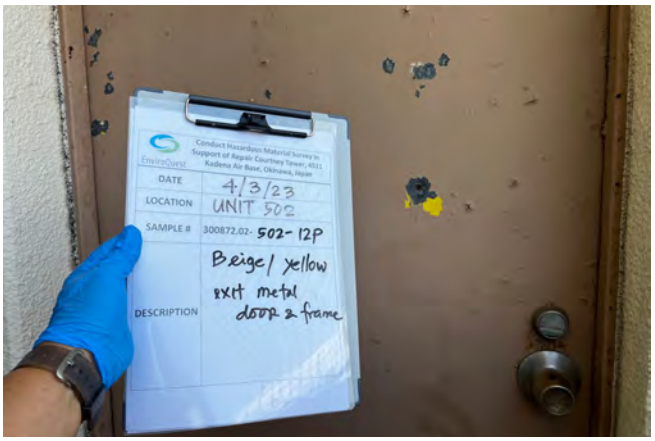



Unit 502

Non lead, cadmium and chromium containing brown painted exterior wall.

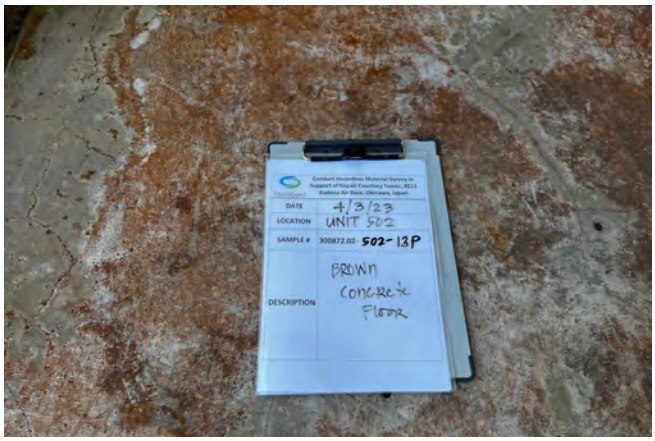
# REFERENCE PHOTOGRAPHS

EnviroQuest



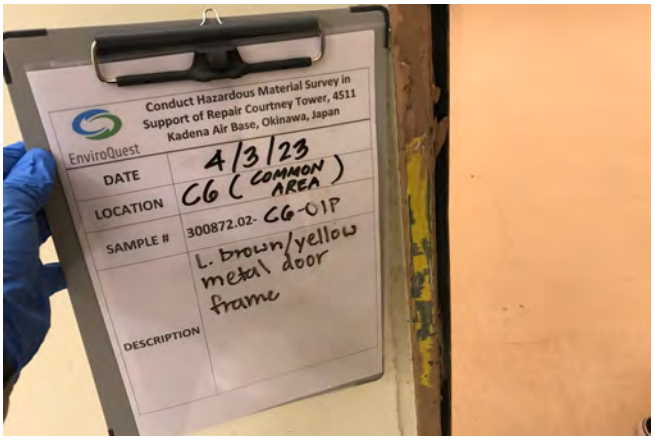

Unit 502

Lead based and chromium containing beige over yellow exterior metal door and frame.




Unit 502

Lead containing brown painted concrete floor.

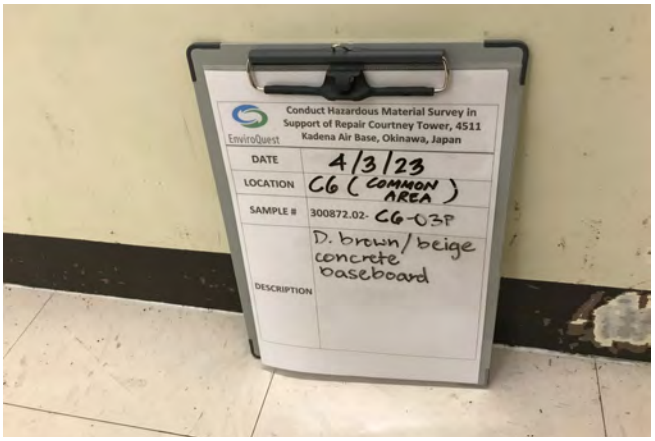



6th floor Common Area

Lead based light brown over yellow painted metal door frame.

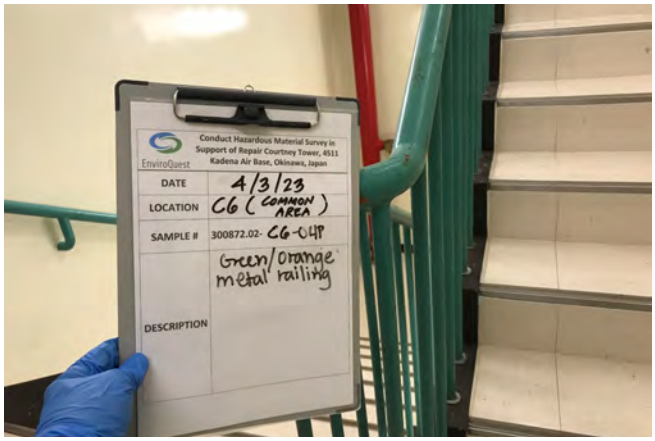
6th floor Common Area

Lead based and chromium containing tan over yellow painted metal door.




6th floor Common Area

Lead and chromium containing dark brown over beige painted concrete baseboard.

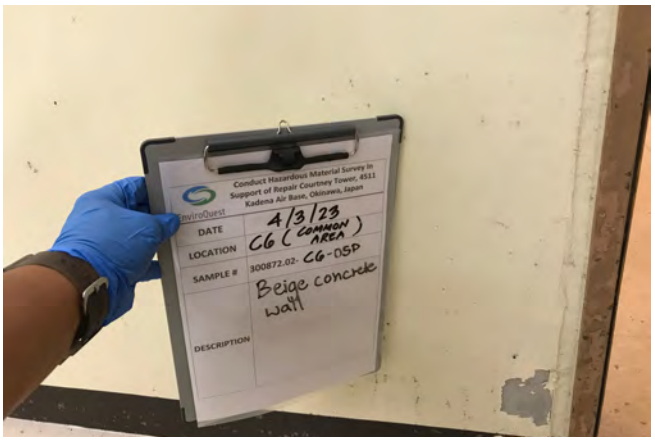



6th floor Common Area

Lead based and chromium containing green over orange painted metal railing.

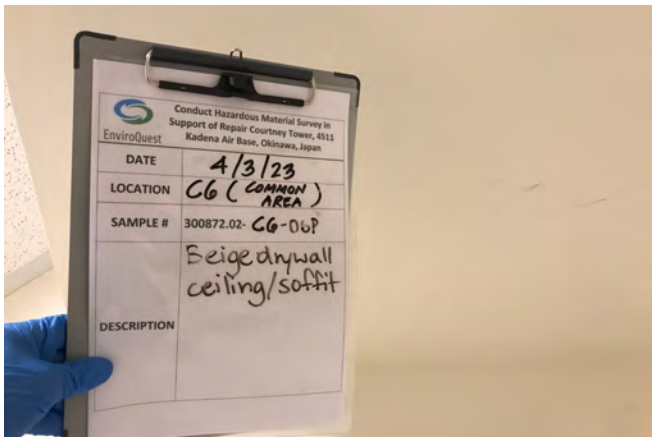
# REFERENCE PHOTOGRAPHS

EnviroQuest



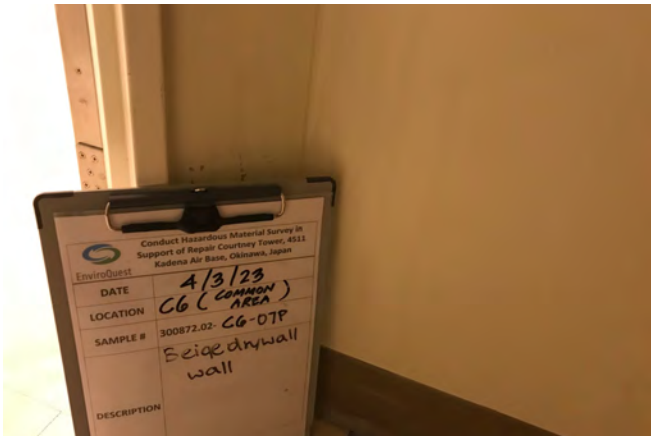

6th floor Common Area

Lead containing beige painted concrete wall.



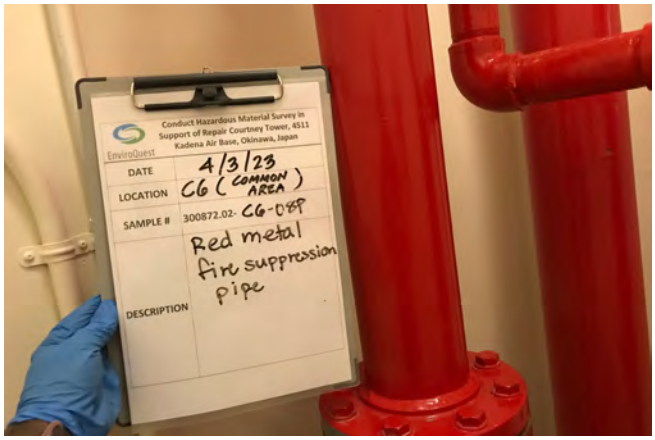

6th floor Common Area

Non lead, cadmium and chromium containing beige painted drywall ceiling/soffit.




6th floor Common Area

Lead containing beige painted beige drywall wall.




6th floor Common Area

Lead based and chromium containing red painted metal fire suppression pipe.

6th floor Common Area

Non lead, cadmium and chromium containing beige painted metal conduit.

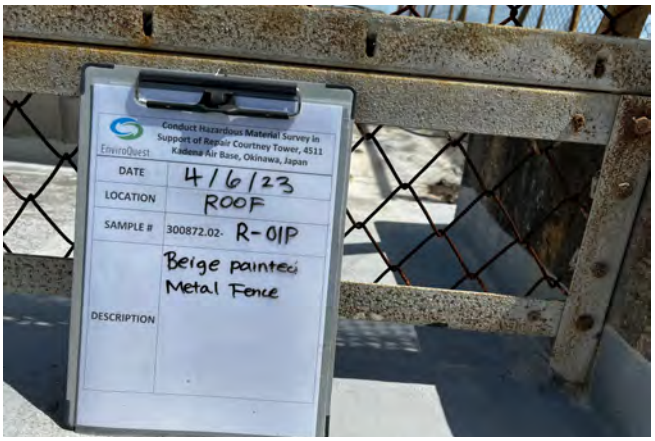
NO PHOTO AVAILABLE

6th floor Common Area

Non lead, cadmium and chromium containing beige painted CMU wall.

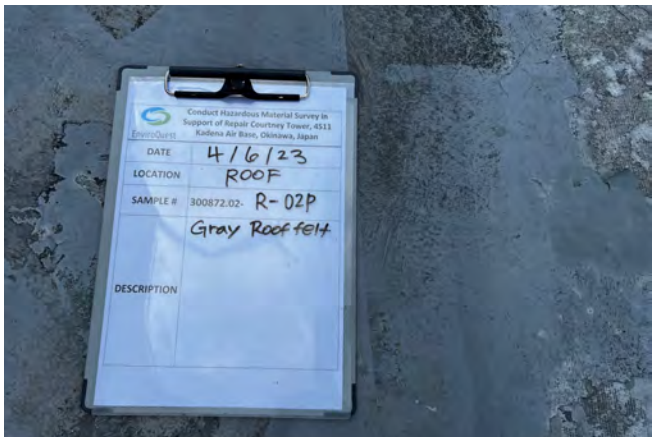
# REFERENCE PHOTOGRAPHS

EnviroQuest




Roof

Lead based and cadmium containing beige painted metal fence.




Roof

Non lead, cadmium and chromium containing gray painted roof felt.

Roof

Non lead, cadmium and chromium containing gray over brown painted roof exhaust vent.

EnviroQuest

# APPENDIX B

## LABORATORY ANALYTICAL REPORTS

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326340** | **300872.02-C1-01A Door Caulking, Restroom** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326341** | **300872.02-C1-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic Over Concrete, Janitor's Closet Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326341** | **300872.02-C1-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic Over Concrete, Janitor's Closet Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Tan floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326341** | **300872.02-C1-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic Over Concrete, Janitor's Closet Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326342** | **300872.02-C1-03A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

EnviroQuest, Inc.
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Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326342** | **300872.02-C1-03A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Gray mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326342** | **300872.02-C1-03A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Off-white floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326343** | **300872.02-C1-04A 2'x2' Pinhole Design Ceiling Tile, Hallway Adjacent to EBS L10C** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/18/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |
| **202326344** | **300872.02-C1-05A Drywall Ceiling/Soffit, Restroom** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326345** | **300872.02-C1-06A Drywall with Joint Compound, Restroom** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326346** | **300872.02-C1-07A 6"x6" Red Quarry Tile w/Grout and Mortar, EBS L10C Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray grout | | | | | | | |
| Comments | | | | | | | | |
| **202326346** | **300872.02-C1-07A 6"x6" Red Quarry Tile w/Grout and Mortar, EBS L10C Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
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**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326346** | **300872.02-C1-07A 6"x6" Red Quarry Tile w/Grout and Mortar, EBS L10C Floor** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Red quarry tile | | | | | | | |
| Comments | | | | | | | | |
| **202326347** | **300872.02-C1-08A 6"x6" Red Quarry Tile w/Grout and Mortar, EBS L10C Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray grout | | | | | | | |
| Comments | | | | | | | | |
| **202326347** | **300872.02-C1-08A 6"x6" Red Quarry Tile w/Grout and Mortar, EBS L10C Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326347** | **300872.02-C1-08A 6"x6" Red Quarry Tile w/Grout and Mortar, EBS L10C Floor** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Red quarry tile | | | | | | | |
| Comments | | | | | | | | |
| **202326348** | **300872.02-C1-09A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase L05** | | NONE DETECTED | | None detected | | Foil | 4/18/2023 |
| Layer | Silver foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326348** | **300872.02-C1-09A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase L05** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326349** | **300872.02-C1-10A Silver Painted Black AC Duct Joint Sealant, Mechanical Room L07** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/18/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326350** | **300872.02-C1-11A Red Pipe Sealant, Mechanical Room** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Glass + binder + other | 4/18/2023 |
| Layer | Red pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326351** | **300872.02-C1-12A Black Flange Gasket, Pipe Chase L05** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Black gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326352** | **300872.02-C1-13A Black Flange Gasket, Pipe Chase L05** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Black gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326353** | **300872.02-C1-14A Green Flange Gasket, Pipe Chase L05** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Green gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326354** | **300872.02-C1-15A Green Flange Gasket, Pipe Chase L05** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Green gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326355** | **300872.02-C1-16A Beige Texture Wall Coating w/Gray Cementitious, Hallway next to Janitor's Closet** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326355** | **300872.02-C1-16A Beige Texture Wall Coating w/Gray Cementitious, Hallway next to Janitor's Closet** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |

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Aiea HI 96701

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326356** | **300872.02-C1-17A Beige Texture Wall Coating w/Gray Cementitious, Hallway next to Stairwell Entrace** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326356** | **300872.02-C1-17A Beige Texture Wall Coating w/Gray Cementitious, Hallway next to Stairwell Entrace** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326357** | **300872.02-C1-18A Gray Concrete Coating, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326358** | **300872.02-C1-18A2 Gray Concrete Coating, Stairwell Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326359** | **300872.02-C1-19A Gray Concrete, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326360** | **300872.02-C1-19A2 Gray Concrete, Stairwell Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326361** | **300872.02-C1-20A Tan Gasket, Storage L09, Fire Suppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326362** | **300872.02-C1-21A 4'x4' Light Blue Ceramic Wall Tile w/Grout and Mortar, Garbage Storage Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326362** | **300872.02-C1-21A 4'x4' Light Blue Ceramic Wall Tile w/Grout and Mortar, Garbage Storage Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Light blue ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326362** | **300872.02-C1-21A 4'x4' Light Blue Ceramic Wall Tile w/Grout and Mortar, Garbage Storage Wall** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326363** | **300872.02-C1-22A 4'x4' Light Blue Ceramic Wall Tile w/Grout and Mortar, Garbage Storage Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326363** | **300872.02-C1-22A 4'x4' Light Blue Ceramic Wall Tile w/Grout and Mortar, Garbage Storage Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Light blue ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326363** | **300872.02-C1-22A 4'x4' Light Blue Ceramic Wall Tile w/Grout and Mortar, Garbage Storage Wall** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326364** | **300872.02-C1-23A Gray Sprayed on Fire Proof Coating over Gray Coating, Main Electrical Room Wall and Ceiling** | | NONE DETECTED | | Fibrous glass (amorphous) | **75** | Calcite + glass beads + other | 4/18/2023 |
| Layer | Gray fireproof material / coating | | | | | | | |
| Comments | | | | | | | | |
| **202326365** | **300872.02-C1-24A Gray Sprayed on Fire Proof Coating over Gray Coating, Main Mechanical Room Wall and Ceiling** | | NONE DETECTED | | Fibrous glass (amorphous) | **75** | Calcite + glass beads + other | 4/18/2023 |
| Layer | Gray fireproof material / coating | | | | | | | |
| Comments | | | | | | | | |
| **202326366** | **300872.02-C1-25A Beige Cloth Wrap w/Silver Foil and Yellow Fiberglass Insulation, Main Mechanical Room D.C.W Pipe** | | NONE DETECTED | | Fibrous glass (amorphous) | **20** | Foil + paint | 4/18/2023 |
| Layer | Silver foil wrap / beige paint | | | | | | | |
| Comments | | | | | | | | |
| **202326366** | **300872.02-C1-25A Beige Cloth Wrap w/Silver Foil and Yellow Fiberglass Insulation, Main Mechanical Room D.C.W Pipe** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326367** | **300872.02-C1-26A Beige Cloth Wrap w/Silver Foil and Yellow Fiberglass Insulation, Main Mechanical Room D.C.W Pipe** | | NONE DETECTED | | Fibrous glass (amorphous) | **20** | Foil + paint | 4/18/2023 |
| Layer | Silver foil wrap / beige paint | | | | | | | |
| Comments | | | | | | | | |
| **202326367** | **300872.02-C1-26A Beige Cloth Wrap w/Silver Foil and Yellow Fiberglass Insulation, Main Mechanical Room D.C.W Pipe** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |

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**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326368** | **300872.02-C1-27A Silver Foil w/Paper Wrap and Yellow Fiberglass, Main Mechanical Room 8" Diameter Pipe Insulation** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326368** | **300872.02-C1-27A Silver Foil w/Paper Wrap and Yellow Fiberglass, Main Mechanical Room 8" Diameter Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326369** | **300872.02-C1-28A Silver Foil w/Paper Wrap and Yellow Fiberglass, Main Mechanical Room 8" Diameter Pipe Insulation** | | NONE DETECTED | | Synthetic fibers (undulose) | **20** | Foil | 4/18/2023 |
| Layer | Silver foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326369** | **300872.02-C1-28A Silver Foil w/Paper Wrap and Yellow Fiberglass, Main Mechanical Room 8" Diameter Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326370** | **300872.02-C1-29A Silver Cloth Vibration Dampener, Main Mechanical Room AC Duct** | | NONE DETECTED | | Fibrous glass (amorphous) | **70** | Other | 4/18/2023 |
| Layer | Silver coat vibration dampener | | | | | | | |
| Comments | | | | | | | | |
| **202326371** | **300872.02-C1-30A Black Felt Flange Gasket, Main Mechanical Room Motor** | | NONE DETECTED | | Cellulose (undulose) | **80** | Other | 4/18/2023 |
| Layer | Black felt gasket | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326372** | **300872.02-C1-31A Black Felt Flange Gasket, Main Mechanical Room Motor** | | NONE DETECTED | | Cellulose (undulose) | **80** | Other | 4/18/2023 |
| Layer | Black felt gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326373** | **300872.02-C1-32A Beige Exterior Textured Wall Coating w/Gray, Area B** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326373** | **300872.02-C1-32A Beige Exterior Textured Wall Coating w/Gray, Area B** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326374** | **300872.02-C1-33A Beige Exterior Textured Wall Coating w/Gray, Area D** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326374** | **300872.02-C1-33A Beige Exterior Textured Wall Coating w/Gray, Area D** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326375** | **300872.02-C1-34A Beige Exterior Textured Wall Coating w/Gray, Area A** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326375** | **300872.02-C1-34A Beige Exterior Textured Wall Coating w/Gray, Area A** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303505
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 1st Floor, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326376** | **300872.02-C1-35A Gray Concrete, Area B Ext. Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326377** | **300872.02-C1-36A Gray Concrete, Area D Ext. Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326378** | **300872.02-C1-37A Gray Concrete, Area A Ext. Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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COMMON AREA 1st FLOOR

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1 - 8

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Door Caulking Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-01A | Restroom 202326340 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"x12" tan vinyl floor tile w/ tan mastic over concrete Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-02A | Janitor's closet floor 202326341 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher<br>Kayla Maher | Received By/Date/Time:<br>04-12-23A11:02 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory** Samples picked up at EQI office.

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2 – 6
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: 12"x12" off white vinyl floor tile w/ gray mastic over gray concrete coating — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-03A | Stair well 202326342 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 2'x2' pinhole design ceiling tile — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-04A | Hallway Adjacent to EBS L10C 202326343 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Drywall ceiling / soffit — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-05A | Restroom 202326341 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3 – 8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall with joint compound Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-06A | Restroom 202326345 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 6"x6" Red quarry tile w/ grout + ~~mortar~~ mortar Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-07A | EBS L10C floor 202326346 |
| 08A | 202326347 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver foilwrap w/ yellow fiberglass insulation Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C1-09A | Pipe chase L05 202326348 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303505

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4 - 6

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver painted black AC duct joint sealant Friable (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-10A | Mechanical Room L07 | 202326349 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Red pipe sealant Friable (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-11A | Mechanical Room | 202326350 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Black flange gasket Friable (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-12A | Pipe chase L05 | 202326351 |
| 13A | | 202326352 |
| | 4 pieces | |
| | Mech room : 14 pieces | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5 - 8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Green flange gasket — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-14A | Pipe chase L05 | 202326353 |
| 15A | | 202326354 |
| | 11 pieces | |
| | Mech room: 43 | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Beige texture wall coating w/ gray cementitious material — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-16A | Hallway next to janitor's closet | 202326355 |
| 17A | Hallway next to stairwell entrance | 202326356 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete coating — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-18A | Mechanical Room wall | 202326357 |
| -18A2 | Stairwell wall | 202326358 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: gray ~~cre~~ concrete — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-19A | Mechanical Room wall | 202326359 |
| -19A2 | Stairwell wall | 202326360 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Tan Gasket — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-20A | Storage Log, Fire suppression pipe | 202326361 |
| | 9 pieces | |
| | Mech room: 2 pieces | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 4"x4" Light blue ceramic wall tile w/grout + mortar — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-21A | Garbage storage wall | 202326362 |
| 22A | | 202326363 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 7 - 8
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray sprayed on fire proof coating ~~w/~~ Over gray coating Friable ~~Non-friable~~

| Sample No. | Location | |
|---|---|---|
| 300872.02-CI-23A | Main Electrical room wall + ceiling | 202326364 |
| 24A | Main Mechanical room wall + ceiling | 202326365 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☑ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Beige cloth wrap w/ silver foil + yellow fiberglass insulation Friable ~~Non-friable~~

| Sample No. | Location | |
|---|---|---|
| 300872.02-CI-25A | Main Mechanical room D.C.W pipe | 202326366 |
| 26A | | 202326367 |
| | ~ 25 ft long | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver foil w/ paper wrap + yellow fiberglass ~~Mechanical Room~~ Friable Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-CI-27A | Main Mechanical Room 8" diameter pipe insulation | 202326368 |
| 28A | | 202326369 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303505

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 8-8
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver cloth vibration dampener — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-29A | Main mechanical room AC duct | 202326370 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Black felt flange gasket — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| ~~300872~~ 30A | Main mechanical room motor | 202326371 |
| 300872.02-C1-31A | | 202326372 |

5 pieces

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Beige (Exterior textured · wall coating W/ gray -cementitious material — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-32A | Area B | 202326373 |
| 33A | Area D | 202326374 |
| 34A | Area A | 202326375 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303505

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 9

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray concrete Friable Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C1-35A | Area B ext. wall | 202326376 |
| 36A | Area D ext. wall | 202326377 |
| 37A | Area A ext. wall | 202326378 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303504
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Multi Purpose Room, Bike Storage, 4/5/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326310** | **300872.02-MP-01A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Beige floor tile (1) | | | | | | | |
| Comments | | | | | | | | |
| **202326310** | **300872.02-MP-01A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326310** | **300872.02-MP-01A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Tan floor tile (2) | | | | | | | |
| Comments | | | | | | | | |
| **202326310** | **300872.02-MP-01A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic (2) | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326310** | **300872.02-MP-01A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Yellow mastic (1) | | | | | | | |
| Comments | | | | | | | | |
| **202326311** | **300872.02-MP-02A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Beige floor tile (1) | | | | | | | |
| Comments | | | | | | | | |
| **202326311** | **300872.02-MP-02A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326311** | **300872.02-MP-02A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Tan floor tile (2) | | | | | | | |
| Comments | | | | | | | | |
| **202326311** | **300872.02-MP-02A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic (2) | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326311** | **300872.02-MP-02A 12"x12" Beige w/Gray Streaks VFT over Tan FT/Tan Mastic/Gray Concrete Coating, Multi Purpose Room Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Yellow mastic (1) | | | | | | | |
| Comments | | | | | | | | |
| **202326312** | **300872.02-MP-03A Brown Covebase w/Tan Mastic, Multi Purpose Room Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326312** | **300872.02-MP-03A Brown Covebase w/Tan Mastic, Multi Purpose Room Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326313** | **300872.02-MP-04A Brown Covebase w/Tan Mastic, Multi Purpose Room Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326313** | **300872.02-MP-04A Brown Covebase w/Tan Mastic, Multi Purpose Room Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326314** | **300872.02-MP-05A Drywall w/Joint Compound, Multi Purpose Room Wall Base** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum | 4/18/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326314** | **300872.02-MP-05A Drywall w/Joint Compound, Multi Purpose Room Wall Base** | | NONE DETECTED | | Cellulose (undulose) | **3** | Gypsum + quartz + paint | 4/18/2023 |
| Layer | White joint compound / white paint | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303504
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Multi Purpose Room, Bike Storage, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326315** | **300872.02-MP-06A Drywall w/Joint Compound, Bike Storage Room Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum | 4/18/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326315** | **300872.02-MP-06A Drywall w/Joint Compound, Bike Storage Room Wall** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **10** | Gypsum + calcite + paint | 4/18/2023 |
| Layer | White joint compound / white paint / mesh | | | | | | | |
| Comments | | | | | | | | |
| **202326316** | **300872.02-MP-07A Gray Door Caulking, Door Exterior** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326317** | **300872.02-MP-08A Gray Door Caulking, Door Interior** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326318** | **300872.02-MP-09A Beige Painted Gray Window Caulking Interior, Multi Purpose Bike Room Window** | | NONE DETECTED | | None detected | | Calcite + binder + paint + other | 4/18/2023 |
| Layer | Gray caulk / beige paint | | | | | | | |
| Comments | | | | | | | | |
| **202326319** | **300872.02-MP-10A Beige Painted Gray Window Caulking Interior, Bike Storage Room Window** | | NONE DETECTED | | None detected | | Calcite + binder + paint + other | 4/18/2023 |
| Layer | Gray caulk / beige paint | | | | | | | |
| Comments | | | | | | | | |
| **202326320** | **300872.02-MP-11A Beige Textured Coating/Gray Window Caulking Exterior, Multi Purpose Room Window** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige textured coat | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326320** | **300872.02-MP-11A Beige Textured Coating/Gray Window Caulking Exterior, Multi Purpose Room Window** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326321** | **300872.02-MP-12A Beige Textured Coating/Gray Window Caulking Exterior, Bike Storage Room Window** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige textured coat | | | | | | | |
| Comments | | | | | | | | |
| **202326321** | **300872.02-MP-12A Beige Textured Coating/Gray Window Caulking Exterior, Bike Storage Room Window** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326322** | **300872.02-MP-13A Concrete Floor, Bike Storage Room Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326323** | **300872.02-MP-14A Concrete Floor, Bike Storage Room Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326324** | **300872.02-MP-15A 2"x2" Pinhole Design Ceiling Tile, Multi Purpose Room Ceiling** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/18/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |
| **202326325** | **300872.02-MP-16A 2"x2" Pinhole Design Ceiling Tile, Multi Purpose Room Ceiling** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/18/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |

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**Your Project:** 300872.02, Repair Courtney Tower 4511, Multi Purpose Room, Bike Storage, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326326** | **300872.02-MP-17A Beige Textured Paint/Gray Cementitious Material, Exterior Wall Coating** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326326** | **300872.02-MP-17A Beige Textured Paint/Gray Cementitious Material, Exterior Wall Coating** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326327** | **300872.02-MP-18A Beige Textured Paint/Gray Cementitious Material, Exterior Wall Coating** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326327** | **300872.02-MP-18A Beige Textured Paint/Gray Cementitious Material, Exterior Wall Coating** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326328** | **300872.02-MP-19A Silver Cloth Vibration Dampener, Bike Storage AC Duct** | | NONE DETECTED | | Fibrous glass (amorphous) | **75** | Foil | 4/18/2023 |
| Layer | Silver cloth vibration dampener | | | | | | | |
| Comments | | | | | | | | |
| **202326329** | **300872.02-MP-20A Silver Cloth Vibration Dampener, Bike Storage AC Duct** | | NONE DETECTED | | Fibrous glass (amorphous) | **75** | Foil | 4/18/2023 |
| Layer | Silver cloth vibration dampener | | | | | | | |
| Comments | | | | | | | | |

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**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Multi Purpose Room, Bike Storage, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326330** | **300872.02-MP-21A Tan Gasket, Bike Storage/Fire Suppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326331** | **300872.02-MP-22A Tan Gasket, Bike Storage/Fire Suppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326332** | **300872.02-MP-23A Silver and Yellow Painted Black AC Duct Joint Sealants, Bike Storage AC Duct** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/18/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326333** | **300872.02-MP-24A Silver and Yellow Painted Black AC Duct Joint Sealants, Bike Storage AC Duct** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/18/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326334** | **300872.02-MP-25A Gray Concrete, Bike Storage Steps** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326335** | **300872.02-MP-26A Gray Concrete, Bike Storage Steps** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326336** | **300872.02-MP-27A Gray Concrete w/Coating, Bike Storage Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete / coating | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303504
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**Your Project:** 300872.02, Repair Courtney Tower 4511, Multi Purpose Room, Bike Storage, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326337** | **300872.02-MP-28A Gray Concrete w/Coating, Bike Storage Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete / coating | | | | | | | |
| Comments | | | | | | | | |
| **202326338** | **300872.02-MP-29A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Bike Storage Pipe Insulation** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326338** | **300872.02-MP-29A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Bike Storage Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326339** | **300872.02-MP-30A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Bike Storage Pipe Insulation** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326339** | **300872.02-MP-30A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Bike Storage Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |

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General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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MULTI PURPOSE ROOM / BIKE STORAGE

EnviroQuest 202303504

**PLM DATA SHEET**

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1-6
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: 12"x12" Beige w/ gray streaks VFT over Tan FT / & Tan mastic / gray concrete coating Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-01A > 02A | Multi Purpose room Floor | 202326310 |
| | | 202326311 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| **OVERALL POTENTIAL RATING** | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Brown covebase w/ tan mastic Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-03A > 04A | Multi purpose Room wall base | 202326312 |
| | | 202326313 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| **OVERALL POTENTIAL RATING** | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher | Received By/Date/Time: 04-12-23A11:01 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples (*Cement/plaster valves, elbows & 'T'*) |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR* >*10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR* < *10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest 2023C3504

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2-6
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall w/ joint compound — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-05A | Multi purpose room wall | 202326314 |
| 06A | ~~A~~ Bike storge room wall | 202326315 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray door caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-07A | Door Exterior | 202326316 |
| 08A | Door Interior | 202326317 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Beige painted Gray window caulking interior — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP09A | Multi purpose Room window | 202326318 |
| 10A | Bike storage Room window | 202326319 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303504

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 3-6
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Beige textured coating / Gray window caulking Exterior — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-11A | Multi purpose room window | 202326320 |
| 12A | Bike storage room window | 202326321 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: concrete Floor — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-13A | Bike storage room floor | 202326322 |
| 14A | | 202326323 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 2"x 2" pinhole design ceiling tile — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-15A | Multi purpose room ceiling | 202326324 |
| 16A | | 202326325 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest

202303504

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 4 - #5
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Beige textured paint / Gray ~~[illegible]~~ Cementitious material
Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-17A | Exterior wall coating | 202326326 |
| 18A | | 202326327 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver cloth vibration dampener
Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-19A | Bike storage AC duct | 202326328 |
| 20A | | 202326329 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Tan Gasket
Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-MP-21A | Bike storage / Fire suppression pipe | 202326330 |
| 22A | | 202326331 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest

202303504

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 5 - 6
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: silver + ~~Bla~~ yellow painted black AC duct joint sealants
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-MP-23A | Bike storage AC duct 202326332 |
| 24A | 202326333 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-MP-25A | Bike storage steps 202326334 |
| 26A | 202326335 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete w/ coating
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-MP-27A | Bike storage ceiling 202326336 |
| 28A | 202326337 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303504

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6-6
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: silver paper foil wrap w/ yellow fiberglass insulation Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-MP-29A | Bike storage pipe insulation 202326338 |
| 30A | 202326339 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303503
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 104, 4/5/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326287** | **300872.02-104-01A 12"x12" Beige Vinyl Floor Tile w/Tan Mastic and Gray Concrete Coating, Hallway Closet Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Beige floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326287** | **300872.02-104-01A 12"x12" Beige Vinyl Floor Tile w/Tan Mastic and Gray Concrete Coating, Hallway Closet Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326287** | **300872.02-104-01A 12"x12" Beige Vinyl Floor Tile w/Tan Mastic and Gray Concrete Coating, Hallway Closet Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326288** | **300872.02-104-02A Gray Concrete, Hallway Closet Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326289** | **300872.02-104-03A Door Caulking, Laundry** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303503
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 104, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326290** | **300872.02-104-04A Window Caulking, Bedroom 3** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326291** | **300872.02-104-05A Light Brown 4" Covebase w/Tan Mastic, Kitchen Pantry** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326291** | **300872.02-104-05A Light Brown 4" Covebase w/Tan Mastic, Kitchen Pantry** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326292** | **300872.02-104-06A Drywall w/ Joint Compound, Kitchen Pantry** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326293** | **300872.02-104-07A Drywall Ceiling, Kitchen Pantry** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326294** | **300872.02-104-08A Black Sink Undercoat, Kitchen Sink** | | NONE DETECTED | | Cellulose (undulose) | **12** | Tar + calcite + quartz | 4/18/2023 |
| Layer | Black sink undercoat | | | | | | | |
| Comments | | | | | | | | |
| **202326295** | **300872.02-104-09A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen, under Sink** | | NONE DETECTED | | Cellulose (undulose) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |

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EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303503
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 104, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326295** | **300872.02-104-09A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen, under Sink** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326296** | **300872.02-104-10A Gray Sealant, Dining Room Patio Railing** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326297** | **300872.02-104-11A Gray Exterior Door Caulking, Dining Room Patio Sliding Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326298** | **300872.02-104-12A Gray Exterior Window Caulking, Bedroom 3** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326299** | **300872.02-104-13A Gray 4"x4" Ceramic Floor Tile w/Grout Mortar, Hallway Bathroom Floor** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Gray ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326299** | **300872.02-104-13A Gray 4"x4" Ceramic Floor Tile w/Grout Mortar, Hallway Bathroom Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326299** | **300872.02-104-13A Gray 4"x4" Ceramic Floor Tile w/Grout Mortar, Hallway Bathroom Floor** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303503
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 104, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326300** | **300872.02-104-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hallway Bathroom Shower Wall** | | NONE DETECTED | | None detected | | Tar | 4/18/2023 |
| Layer | Black tar | | | | | | | |
| Comments | | | | | | | | |
| **202326300** | **300872.02-104-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hallway Bathroom Shower Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326300** | **300872.02-104-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hallway Bathroom Shower Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326300** | **300872.02-104-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hallway Bathroom Shower Wall** | | NONE DETECTED | | None detected | | Calcite + gypsum | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326301** | **300872.02-104-15A Exterior Beige Wall Coating w/Gray Cementitious Materials, Exterior Dining Patio Wall** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326301** | **300872.02-104-15A Exterior Beige Wall Coating w/Gray Cementitious Materials, Exterior Dining Patio Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303503
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 104, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326302** | **300872.02-104-16A White Pipe Penetration Sealant, Kitchen above Ceiling** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **10** | Paint + calcite + binder | 4/18/2023 |
| Layer | White pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326303** | **300872.02-104-17A Red Pipe Penetration Sealant, Kitchen above Ceiling** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Glass + binder + other | 4/18/2023 |
| Layer | Red pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326304** | **300872.02-104-18A Black Felt w/Yellow Fiberglass Insulation, AC Unit Cover Plate** | | NONE DETECTED | | Fibrous glass (amorphous) | **95** | Other | 4/18/2023 |
| Layer | Black felt / yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326305** | **300872.02-104-19A Black Felt w/Yellow Fiberglass Insulation, AC Unit Cover Plate** | | NONE DETECTED | | Fibrous glass (amorphous) | **95** | Other | 4/18/2023 |
| Layer | Black felt / yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326306** | **300872.02-104-20A Concrete Ceiling, Kitchen above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326307** | **300872.02-104-21A Concrete Coating, Laundry Wall above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326308** | **300872.02-104-22A Gray Concrete, Laundry Wall above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303503
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 104, 4/5/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326309** | **300872.02-104-23A Silver Cloth Wrap w/Brown Fiberflass Insulation, Kitchen, Fume Hood Exhaust Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Brown insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326309** | **300872.02-104-23A Silver Cloth Wrap w/Brown Fiberflass Insulation, Kitchen, Fume Hood Exhaust Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | **15** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |

General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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EnviroQuest 202303503 Unit 104

**PLM DATA SHEET**

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: ~~1-6~~ 1-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: 12"x12" beige vinyl floor tile W/ tan mastic + gray concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-104-~~A1~~ 01A | Hallway closet floor ~~202303503~~ 202326287 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| **OVERALL POTENTIAL RATING** | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-104-~~A2~~ 02A | Hallway closet floor 202326288 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| **OVERALL POTENTIAL RATING** | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher Kayla Maher | Received By/Date/Time: 04-12-23A11:00 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR* >*10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR* < *10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest 202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: ~~2-6~~ 2-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Door Caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-03A | Laundry | 202326289 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Window caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-04A | Bedroom 3 | 202326290 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Light Brown 4" covebase w/ tan mastic — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-05A | Kitchen Pantry | 202326291 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: ~~3-6~~ 3-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Drywall w/ joint compound
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-104-06A | Kitchen Pantry 202326292 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Drywall ceiling
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-104-07A | Kitchen Pantry 202326293 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Black sink undercoat
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-104-08A | Kitchen Sink 202326294 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest

202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: ~~#-6~~ 4-8

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver paper foil wrap w/ yellow fiberglass insulation Friable (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-104-09A | Kitchen, under sink 202326295 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray Sealant Friable (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-104-10A | Dining Room Patio railing 202326296 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray exterior door caulking Friable (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-104-11A | Dining room Patio sliding door 202326297 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest

202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: ~~5-6~~ 5-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Gray exterior window caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-12A | Bedroom 3 | 202326298 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray 4"x4" ceramic floor tile w/ grout + mortar — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-13A | Hallway Bathroom floor | 202326299 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Pink 4"x4" ceramic wall tile w/ grout + mortar + black tar — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-14A | Hallway Bathroom shower wall | 202326300 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: ~~6-6~~ 6-8

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Exterior beige wall coating w/ gray cementitions materials Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-104-15A | Exterior dining patio wall 202326301 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: White pipe penetration sealant Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-104-16A | Kitchen above ceiling 202326302 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Red pipe penetration sealant Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-104-17A | Kitchen above ceiling 202326303 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 7-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Black felt w/ yellow fiberglass insulation — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-18A | AC unit cover plate | 202326304 |
| 19A | | 202326305 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Concrete Ceiling — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-20A | Kitchen above ceiling | 202326306 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Concrete coating — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-104-21A | Laundry wall above ceiling | 202326307 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303503

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 8-8
DATE: 4/5/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Gray concrete
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-104-22A | Laundry wall above ceiling 202326308 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver cloth wrap W/ brown fiberglass insulation
Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-104-23A | Kitchen, fume hood exhaust pipe insulation 202326309 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description:
Friable / Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303499
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 201, 4/4/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326213** | **300872.02-201-01A 12"x12" Beige VFT w/Tan Mastic and Gray Concrete Coating, Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Beige floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326213** | **300872.02-201-01A 12"x12" Beige VFT w/Tan Mastic and Gray Concrete Coating, Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326213** | **300872.02-201-01A 12"x12" Beige VFT w/Tan Mastic and Gray Concrete Coating, Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326214** | **300872.02-201-02A Gray Concrete, Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326215** | **300872.02-201-03A Door Caulking, Bedroom 3 Door** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303499
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 201, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326216** | **300872.02-201-04A Window Caulking, Bedroom 2 Window** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326217** | **300872.02-201-05A Light 4" Covebase w/Tan Mastic, Laundry, Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326217** | **300872.02-201-05A Light 4" Covebase w/Tan Mastic, Laundry, Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326218** | **300872.02-201-06A Drywall w/ Joint Compound, Kitchen Pantry, Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint + mica | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326219** | **300872.02-201-07A Drywall Ceiling, Kitchen Pantry, Ceiling** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint + mica | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326220** | **300872.02-201-08A Blank Sink Undercoat, Kitchen Sink** | | NONE DETECTED | | Cellulose (undulose) | **12** | Tar + calcite + quartz | 4/18/2023 |
| Layer | Black sink undercoat | | | | | | | |
| Comments | | | | | | | | |
| **202326221** | **300872.02-201-09A Silver Paper Foil Wrap /Yellow Fiberglass Insulation, Kitchen, Under Sink** | | NONE DETECTED | | Cellulose (undulose) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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**Lab Job No:** 202303499
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 201, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326221** | **300872.02-201-09A Silver Paper Foil Wrap /Yellow Fiberglass Insulation, Kitchen, Under Sink** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326222** | **300872.02-201-10A Gray Sealant, Ext. Dining Room Patio Railing** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326223** | **300872.02-201-11A Gray Exterior Door Caulking, Ext. Dining Room Patio Sliding Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326224** | **300872.02-201-12A Gray Ext. Window Caulking, Ext. Dining Room Patio Window** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326225** | **300872.02-201-13A Gray 4"x4" Ceramic Floor Tile w/ Grout Mastic, Restroom Floor** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Gray ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326225** | **300872.02-201-13A Gray 4"x4" Ceramic Floor Tile w/ Grout Mastic, Restroom Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326225** | **300872.02-201-13A Gray 4"x4" Ceramic Floor Tile w/ Grout Mastic, Restroom Floor** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303499
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 201, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326226** | **300872.02-201-14A Ext. Beige Wall Coating w/Gray Cementitious Material, Ext. Dining Room Patio Wall** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326226** | **300872.02-201-14A Ext. Beige Wall Coating w/Gray Cementitious Material, Ext. Dining Room Patio Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326227** | **300872.02-201-15A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Tar | 4/18/2023 |
| Layer | Black tar | | | | | | | |
| Comments | | | | | | | | |
| **202326227** | **300872.02-201-15A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326227** | **300872.02-201-15A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326227** | **300872.02-201-15A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303499
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 201, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326228** | **300872.02-201-16A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Tar | 4/18/2023 |
| Layer | Black tar | | | | | | | |
| Comments | | | | | | | | |
| **202326228** | **300872.02-201-16A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326228** | **300872.02-201-16A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326228** | **300872.02-201-16A Pink 4"x4" Ceramic Wall Tile w/Grout, Mortar and Black Tar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326229** | **300872.02-201-17A White Pipe Penetration Sealant, M. Bed Restroom, Above Ceiling** | **Yes** | Chrysotile | **2** | Fibrous glass (amorphous) | **5** | Calcite + binder + other | 4/18/2023 |
| Layer | White pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326230** | **300872.02-201-18A White Pipe Penetration Sealant, M. Bed Restroom, Above Ceiling** | **Yes** | Chrysotile | **2** | Fibrous glass (amorphous) | **5** | Calcite + binder + other | 4/18/2023 |
| Layer | White pipe sealant | | | | | | | |
| Comments | | | | | | | | |

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**Phone Number:** (808)486-5881
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**Lab Job No:** 202303499
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 201, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326231** | **300872.02-201-19A Gray Concrete w/Concrete Coating, Laundry Room Above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326232** | **300872.02-201-21A Concrete Coating, Laundry Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326233** | **300872.02-201-22A Gray Concrete, Laundry Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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202303499

Unit 201

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 1 - 8

DATE: 4/4/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

Material Description: 12"x12" beige VFT w/ tan mastic & gray concrete coating

Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-201-01A | Kitchen floor |
| | (All floors except restrooms) includes closets |

202326213

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete

Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-201-02A | Kitchen floor |
| | (under VFT) |

202326214

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher | Received By/Date/Time: 04-12-23A10:57 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = *> 10% Dist. or 25% Local* | Damaged = *< 10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = *>10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = *< 10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = *> 10% Dist. or 25% Local* | Damaged = *< 10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest 202303499

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2-~~1~~
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Door caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-201-03A | Bedroom 3 door 202326215 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: window caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-201-04A | Bedroom 2 window 202326216 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Light brown 4" covebase w/ tan mastic — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-201-05A | Laundry, wall base 202326217 |
| | (all wall base except restrooms, Includes closets) |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

202303499

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3-B
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall w/ joint compound — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-201-06A | Kitchen pantry, wall 202326218 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Drywall ceiling — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-201-07A | Kitchen pantry, ceiling 202326219 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Black sink undercoat — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-201-08A | Kitchen sink 202326220 |
| | (2 pieces) |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

EnviroQuest 202303499

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4-3
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver paper foil wrap w/ yellow fiberglass insulation — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-201-09A | Kitchen, under sink 202326221 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☒ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray sealant — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-201-10A | Ext. dining room patio railing 202326222 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray exterior door caulking — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-201-11A | Ext. dining room patio sliding door 202326223 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303499

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5-1
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray ext. window caulking — Friable / Non-Friable (Non-Friable)

| Sample No. | Location |
|---|---|
| 300872.02-201-12A | Ext. Dining room patio window 202326224 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Gray 4"x4" ceramic floor tile w/ grout + mortar — Friable / Non-Friable (Non-Friable)

| Sample No. | Location |
|---|---|
| 300872.02-201-13A | Restroom floor 202326225 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Ext. beige wall coating w/ gray cementitious material — Friable / Non-Friable (Non-Friable)

| Sample No. | Location |
|---|---|
| 300872.02-201-14A | Ext. dining room patio wall 202326226 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

EnviroQuest 202303499

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6 - 7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Pink 4"x4" ceramic wall tile w/ grout, mortar & black tar — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-201-15A | restroom wall | 202326227 |
| 16A | | 202326228 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: White pipe penetration sealant — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-201-17A | M. bed restroom, above ceiling | 202326229 |
| 18A | | 202326230 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete w/ concrete coating — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-201-19A | Laundry room above ceiling | 202326231 |
| | Ceiling | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303499

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 7-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: concrete coating Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-201-21A | Laundry room wall 202326232 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-201-22A | Laundry room wall 202326233 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable / Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303501
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C3 (3rd Common), 4/4/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326253** | **300872.02-C3-01A Door Caulking, Unit 301 Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326254** | **300872.02-C3-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10C Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326254** | **300872.02-C3-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10C Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Tan floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326254** | **300872.02-C3-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10C Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326255** | **300872.02-C3-03A Gray Concrete, EBS C10c Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303501
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C3 (3rd Common), 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326256** | **300872.02-C3-04A 12"x12" Off-White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326256** | **300872.02-C3-04A 12"x12" Off-White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Gray mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326256** | **300872.02-C3-04A 12"x12" Off-White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Off-white floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326257** | **300872.02-C3-05A 2'x2' Pinhole Design Ceiling Tile, Hallway** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/18/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |
| **202326258** | **300872.02-C3-06A Drywall Ceiling/Soffit, Hallway Adjacent to EBS C10G** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum | 4/18/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326258** | **300872.02-C3-06A Drywall Ceiling/Soffit, Hallway Adjacent to EBS C10G** | | NONE DETECTED | | Cellulose (undulose) | **3** | Calcite + quartz + mica + paint | 4/18/2023 |
| Layer | White joint compound / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326259** | **300872.02-C3-07A Light Brown 4" Covebase with Tan Mastic, EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303501
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C3 (3rd Common), 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326259** | **300872.02-C3-07A Light Brown 4" Covebase with Tan Mastic, EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326260** | **300872.02-C3-08A Drywall w/Joint Compound, EBS C10G, Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint + mica | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326261** | **300872.02-C3-09A Tan Gasket, Storage C07 Fire Suppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326262** | **300872.02-C3-10A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C02 Pipe Insulation** | | NONE DETECTED | | Synthetic fibers (undulose) | **15** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326262** | **300872.02-C3-10A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C02 Pipe Insulation** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326263** | **300872.02-C3-11A Red Pipe Sealant, Mechanical Room C08** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Glass + binder + other | 4/18/2023 |
| Layer | Red pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326264** | **300872.02-C3-12A Silver Painted Black AC Duct Joint Sealant, Storage C07 AC Duct** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/18/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303501
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C3 (3rd Common), 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326265** | **300872.02-C3-13A Silver Painted Tan AC Duct Joint Gasket, Storage C07** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **75** | Paint | 4/18/2023 |
| Layer | Tan gasket / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326266** | **300872.02-C3-14A Gray Concrete w/Coating, Hallway, Ceiling, above Ceiling Tile** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326266** | **300872.02-C3-14A Gray Concrete w/Coating, Hallway, Ceiling, above Ceiling Tile** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326267** | **300872.02-C3-15A Concrete Coating, Mech Room C08 Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326268** | **300872.02-C3-15A2 Concrete Coating, Stairwell Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326269** | **300872.02-C3-16A Gray Concrete, Mech Room C08 Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326270** | **300872.02-C3-16A2 Gray Concrete, Stairwell Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303501
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C3 (3rd Common), 4/4/23

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General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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C3 (3rd commom)

EnviroQuest 202303501

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Door caulking Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C3-01A | Unit 301 door 202326253 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"X12" tan vinyl floor tile w/ tan mastic over concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C3-02A | EBS C10C floor 202326254 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher Kayla Maher | Received By/Date/Time: 04-12-23A10:58 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 $ft^2$ = 3 Samples | 1,000 – 5,000 $ft^2$ = 5 Samples | >5,000 $ft^2$ = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or $ft^2$ = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest

202303501

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray concrete — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C3-03A | EBS C10C floor 202326255 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"x12" offwhite vinyl floor tile w/ gray mastic over gray concrete coating — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C3-04A | Stairwell floor 202326256 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 2'X2' pinhole design celling tile — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C3-05A | Hallway 202326257 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303501

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall ceiling /soffit — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-06A | Hallway adjacent to EBS C10G | 202326258 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Light brown 4" covebase with tan mastic — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-07A | EBS C10G, wallbase | 202326259 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Drywall w/ joint compound — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-08A | EBS C10G, wall | 202326260 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303501

EnviroQuest

**PLM DATA SHEET**

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Tan gasket — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-09A | Storage C07 fire suppression pipe | 202326261 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver foilwrap w/ yellow fiberglass insulation — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-10A | pipe chase C02 pipe ~~insolation~~ insulation | 202326262 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Red pipe sealant — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-11A | Mechanical Room C08 | 202326263 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303501

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver painted black AC duct joint Sealant — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-12A | Storage C07 AC duct | 202326264 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver painted tan AC duct joint gasket — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-13A | ~~Storge~~ Storage C07 ø | 202326265 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete W/ coating — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-14A | Hallway, ceiling, Above ceiling tile | 202326266 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303501

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 6
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Concrete coating — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-15A | MECH room C08 wall | 202326267 |
| -15A2 | Stairwell wall | 202326268 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C3-16A | MECH room C08 wall | 202326269 |
| -16A2 | Stairwell wall | 202326270 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: — Friable / Non-friable

| Sample No. | Location |
|---|---|

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303500
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 403, 4/4/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326234** | **300872.02-403-01A 12"x12" Beige VFT w/Tan Mastic and Gray Concrete Coating, Bedroom 2 Closet Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Beige floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326234** | **300872.02-403-01A 12"x12" Beige VFT w/Tan Mastic and Gray Concrete Coating, Bedroom 2 Closet Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326234** | **300872.02-403-01A 12"x12" Beige VFT w/Tan Mastic and Gray Concrete Coating, Bedroom 2 Closet Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326235** | **300872.02-403-02A Gray Concrete, Bedroom 2 Closet Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326236** | **300872.02-403-03A Door Caulking, Laundry Room Door** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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**Lab Job No:** 202303500
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 403, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326237** | **300872.02-403-04A Window Caulking, Master Bedroom Window** | **Yes** | Chrysotile | **2** | None detected | | Tar | 4/18/2023 |
| Layer | Black caulks (limited) | | | | | | | |
| Comments | | | | | | | | |
| **202326237** | **300872.02-403-04A Window Caulking, Master Bedroom Window** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326238** | **300872.02-403-05A Light Brown 4" Covebase w/Tan Mastic, Hallway Closet Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326238** | **300872.02-403-05A Light Brown 4" Covebase w/Tan Mastic, Hallway Closet Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326239** | **300872.02-403-06A Drywall w/Joint Compound, Kitchen Pantry Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326240** | **300872.02-403-07A Drywall Ceiling, Kitchen Pantry Ceiling** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326241** | **300872.02-403-08A Black Sink Undercoat, Kitchen Sink** | | NONE DETECTED | | Cellulose (undulose) | **12** | Tar + calcite + quartz | 4/18/2023 |
| Layer | Black sink undercoat | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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**Lab Job No:** 202303500
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 403, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326242** | **300872.02-403-09A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen under Sink** | | NONE DETECTED | | Cellulose (undulose) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326242** | **300872.02-403-09A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen under Sink** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326243** | **300872.02-403-10A Gray Sealant, Dining Room Patio Railing Base** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326244** | **300872.02-403-11A Ext. Door Caulking, Dining Room Patio Sliding Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326245** | **300872.02-403-12A Ext. Window Caulking, Bedroom 2 Window** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326246** | **300872.02-403-13A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Restrom Floor** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Gray ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326246** | **300872.02-403-13A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Restrom Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303500
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 403, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326246** | **300872.02-403-13A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Restrom Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326247** | **300872.02-403-14A Pink 4'x4' Ceramic Wall Tile w/Grout Mortar and Black Tar, Hallway Restroom Wall** | | NONE DETECTED | | None detected | | Tar | 4/18/2023 |
| Layer | Black tar | | | | | | | |
| Comments | | | | | | | | |
| **202326247** | **300872.02-403-14A Pink 4'x4' Ceramic Wall Tile w/Grout Mortar and Black Tar, Hallway Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326247** | **300872.02-403-14A Pink 4'x4' Ceramic Wall Tile w/Grout Mortar and Black Tar, Hallway Restroom Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326247** | **300872.02-403-14A Pink 4'x4' Ceramic Wall Tile w/Grout Mortar and Black Tar, Hallway Restroom Wall** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326248** | **300872.02-403-15A Ext. Beige Wall Coating w/Gray Cementitious Material, Dining Room Patio Wall** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

EnviroQuest, Inc.
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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303500
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 403, 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326248** | **300872.02-403-15A Ext. Beige Wall Coating w/Gray Cementitious Material, Dining Room Patio Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326249** | **300872.02-403-16A White Pipe Penetration Sealant, Master Bedroom Restroom above Ceiling** | **Yes** | Chrysotile | **2** | Fibrous glass (amorphous) | **5** | Calcite + binder + other | 4/18/2023 |
| Layer | White pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326250** | **300872.02-403-17A Gray Concrete w/Concrete Coating, Laundry, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326250** | **300872.02-403-17A Gray Concrete w/Concrete Coating, Laundry, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326251** | **300872.02-403-18A Concrete Coating, Laundry Wall, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326252** | **300872.02-403-19A Gray Concrete, Laundry Wall, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303500
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 403, 4/4/23

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General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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EnviroQuest 202303500 Unit 403

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1 - 7
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: 12"x12" beige VFT w/ tan mastic & gray concrete coating — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-403-01A | Bedroom 2 closet floor 202326234 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-403-02A | Bedroom 2 closet floor 202326235 |
| | (under VFT) |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher Kayla Maher | Received By/Date/Time: 04-12-23A10:58 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 $ft^2$ = 3 Samples | 1,000 – 5,000 $ft^2$ = 5 Samples | >5,000 $ft^2$ = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS.... | <6 In. or $ft^2$ = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory** Samples picked up at EQI office.

202303500

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2-4

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Door caulking Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-403-03A | Laundry room door 202326236 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Window caulking Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-403-04A | Master bedroom window 202326237 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Light brown 4" covebase w/ tan mastic Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-403-05A | Hallway closet wall base 202326238 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

202303500

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# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3-B
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall w/ joint compound — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-403-06A | Kitchen pantry wall ~~202326238~~ 202326239 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Drywall ceiling — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-403-07A | Kitchen pantry ceiling 202326240 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Black sink undercoat — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-403-08A | Kitchen sink 202326241 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

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202303500

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: silver paper foil wrap w/ yellow fiberglass insulation Friable (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-403-09A | Kitchen under sink 202326242 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☑ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Gray sealant Friable (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-403-10A | Dining room patio railing base 202326243 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: ext. door caulking Friable (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-403-11A | Dining room patio sliding door 202326244 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

202303500

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# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Ext. window caulking — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-403-12A | Bedroom 2 ~~[illegible]~~ window 202326245 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Gray 4"x4" ceramic floor tile w/ grout & mortar — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-403-13A | Master bedroom restroom floor 202326246 |
| | (same in both bathrooms) |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Pink 4"x4" ceramic wall tile w/ grout mortar & black tar — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location |
|---|---|
| 300877.02-403-14A | Hallway restroom wall 202326247 |
| | (same in both bathrooms) |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

202303500

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6 - 7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Ext. beige wall coating w/ gray cementitious material — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-403-15A | Dining room patio wall | 202326248 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: White pipe penetration sealant — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-403-16A | Master bedroom restroom above ceiling | 202326249 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete w/ concrete coating — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 30087202-403-17A | Laundry ~~[illegible]~~, above ceiling | 202326250 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

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# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 7-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: concrete coating Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-403-18A | Laundry wall, above ceiling 202326251 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-403-19A | Laundry wall, above ceiling 202326252 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable / Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303498
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326175** | **300872.02-502-01A 12"x12" Beige VFT w/Tan Mastic Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Beige floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326175** | **300872.02-502-01A 12"x12" Beige VFT w/Tan Mastic Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326176** | **300872.02-502-02A 12"x12" Beige VFT w/Tan Mastic Hallway Floor, Outside Master Bedroom** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Beige floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326176** | **300872.02-502-02A 12"x12" Beige VFT w/Tan Mastic Hallway Floor, Outside Master Bedroom** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326177** | **300872.02-502-03A Gray Concrete Coating Kitchen, Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326178** | **300872.02-502-04A Gray Concrete Coating Hallway Floor Outside Master Bedroom** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326179** | **300872.02-502-05A Gray Concrete Kitchen Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326180** | **300872.02-502-06A Gray Concrete Master Bedroom Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326181** | **300872.02-502-07A Door Caulking Main Entry Door** | | NONE DETECTED | | None detected | | Paint + binder + other | 4/17/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326182** | **300872.02-502-08A Door Caulking Restroom Door** | | NONE DETECTED | | None detected | | Binder + other | 4/17/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326183** | **300872.02-502-09A Window Caulking Master Bedroom** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326184** | **300872.02-502-10A Window Caulking Bedroom 2** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326185** | **300872.02-502-11A Light Brown 4" Covebase w/Tan Mastic Master Bedroom Closet** | **Yes** | Chrysotile | **2** | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Gray mastic | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326185** | **300872.02-502-11A Light Brown 4" Covebase w/Tan Mastic Master Bedroom Closet** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326185** | **300872.02-502-11A Light Brown 4" Covebase w/Tan Mastic Master Bedroom Closet** | | NONE DETECTED | | None detected | | Binder + other | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326186** | **300872.02-502-12A Light Brown 4" Covebase w/Tan Mastic Hallway, Entry Door** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326186** | **300872.02-502-12A Light Brown 4" Covebase w/Tan Mastic Hallway, Entry Door** | | NONE DETECTED | | None detected | | Binder + other | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326187** | **300872.02-502-13A Drywall w/Joint Compound Bedroom 2, Closet Well** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum | 4/17/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326187** | **300872.02-502-13A Drywall w/Joint Compound Bedroom 2, Closet Well** | | NONE DETECTED | | Cellulose (undulose) | **2** | Calcite + quartz + paint | 4/17/2023 |
| Layer | White joint compound / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326188** | **300872.02-502-14A Drywall w/Joint Compound Bedroom 3, Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/17/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326189** | **300872.02-502-15A Drywall Ceiling/Soffit Laundry, Ceiling** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/17/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326190** | **300872.02-502-16A Drywall Ceiling/Soffit Kitchen, Soffit** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/17/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326191** | **300872.02-502-17A Black Sink Undercoat Kitchen Sink** | | NONE DETECTED | | Cellulose (undulose) | **12** | Tar + calcite + quartz | 4/17/2023 |
| Layer | Black sink undercoat | | | | | | | |
| Comments | | | | | | | | |
| **202326192** | **300872.02-502-18A Black Sink Undercoat Kitchen Sink** | | NONE DETECTED | | Cellulose (undulose) | **12** | Tar + calcite + quartz | 4/17/2023 |
| Layer | Black sink undercoat | | | | | | | |
| Comments | | | | | | | | |
| **202326193** | **300872.02-502-19A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen, Under Sink** | | NONE DETECTED | | Cellulose (undulose) | **50** | Foil | 4/17/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326193** | **300872.02-502-19A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen, Under Sink** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/17/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326194** | **300872.02-502-20A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen, Under Sink** | | NONE DETECTED | | Cellulose (undulose) | **50** | Foil | 4/17/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

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|---|---|---|---|---|---|---|---|---|
| **202326194** | **300872.02-502-20A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen, Under Sink** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/17/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326195** | **300872.02-502-21A Gray Sealant, Base of Railing, Outside of Dining** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326196** | **300872.02-502-22A Gray Sealant, Base of Railing, Outside of Dining** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326197** | **300872.02-502-23A Gray Ext. Door Caulking, Dining Room Balcony Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326198** | **300872.02-502-24A Gray Ext. Door Caulking, Master Bedroom Balcony Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326199** | **300872.02-502-25A Gray Ext. Window Caulking, Kitchen Balcony Window Frame** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326200** | **300872.02-502-26A Gray Ext. Window Caulking, Kitchen Balcony Window Frame** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

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|---|---|---|---|---|---|---|---|---|
| **202326201** | **300872.02-502-27A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Restroom 1** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/17/2023 |
| Layer | Gray ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326201** | **300872.02-502-27A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Restroom 1** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326201** | **300872.02-502-27A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Restroom 1** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326202** | **300872.02-502-28A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Restroom** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/17/2023 |
| Layer | Gray ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326202** | **300872.02-502-28A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Restroom** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326202** | **300872.02-502-28A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Restroom** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326203** | **300872.02-502-29A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |

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| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326203** | **300872.02-502-29A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar, Restroom Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/17/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326203** | **300872.02-502-29A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326204** | **300872.02-502-30A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326204** | **300872.02-502-30A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar, Restroom Wall** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/17/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326204** | **300872.02-502-30A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar, Restroom Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326205** | **300872.02-502-31A Ext. Beige Wall Coating w/Gray Cementitious Material, Dining Room Balcony Wall** | | NONE DETECTED | | Polypropylene (undulose) + cellulose (undulose) | **3** | Paint + calcite + binder | 4/17/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326205** | **300872.02-502-31A Ext. Beige Wall Coating w/Gray Cementitious Material, Dining Room Balcony Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/17/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303498
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326206** | **300872.02-502-32A Ext. Beige Wall Coating w/Gray Cementitious Material, Master Bedroom Balcony Wall** | | NONE DETECTED | | Cellulose (undulose) | **3** | Paint + calcite + binder | 4/17/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326206** | **300872.02-502-32A Ext. Beige Wall Coating w/Gray Cementitious Material, Master Bedroom Balcony Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326207** | **300872.02-502-33A Gray Concrete w/Coating, Laundry, above Ceiling, Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326207** | **300872.02-502-33A Gray Concrete w/Coating, Laundry, above Ceiling, Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/17/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326208** | **300872.02-502-34A Gray Concrete w/Coating, Laundry, above Ceiling, Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326209** | **300872.02-502-35A Concrete Coating, Laundry, above Ceiling, Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/17/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326210** | **300872.02-502-36A Concrete Coating, Laundry, above Ceiling, Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/17/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303498
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326211** | **300872.02-502-37A Gray Concrete, Laundry, above Ceiling, Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326212** | **300872.02-502-38A Gray Concrete, Laundry, above Ceiling, Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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EnviroQuest

202303498
Unit 502

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 1-7
DATE: 4/3/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: 12"x12" beige VFT w/ tan mastic
Friable / (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-01A | Kitchen, floor | 202326175 |
| 02A | Hallway floor, outside master bedroom | 202326176 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☑ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Gray concrete coating
Friable / (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-03A | Kitchen, floor | 202326177 |
| 04A | Hallway floor outside master bedroom | 202326178 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☒ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

| | | |
|---|---|---|
| Sampled By: Landon Awada, Jesus Sacramento | Relinquished By/Date/Time: L. Awada 4/12/23 | Relinquished By/Date/Time: |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher | Received By/Date/Time: 04-12-23A10:56 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS.... | <6 In. or ft² = 1 Sample | Minimum of 2 Samples (*Cement/plaster valves, elbows & 'T'*) |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest

202303498

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2-1
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray concrete — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-S02-05A | Kitchen floor | 202326179 |
| 06A | ~~Hallway floor outside of~~ master bedroom floor | 202326180 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Door caulking — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-S02-07A | Main entry door | 202326181 |
| 08A | Restroom, door | 202326182 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Window caulking — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-S02-09A | Master bedroom | 202326183 |
| 10A | Bedroom 2 | 202326184 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

EnviroQuest 202303498

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Light brown 4" cove base w/ tan mastic — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300870.02-502-11A | Master bedroom closet | 202326185 |
| 12A | Hallway, entry door | 202326186 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Drywall w/ joint compound — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-13A | Bedroom 2, closet wall | 202326187 |
| 14A | Bedroom 3, wall | 202326188 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Drywall ceiling/soffit — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-15A | Laundry, ceiling | 202326189 |
| 16A | Kitchen, soffit | 202326190 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

EnviroQuest 202303498

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4 - 7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Black sink undercoat — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-17A | Kitchen sink | 202326191 |
| 18A | | 202326192 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: silver paper foil wrap w/ yellow fiberglass insulation — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-19A | kitchen, under sink | 202326193 |
| 20A | | 202326194 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☒ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Gray sealant — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-21A | Base of railing, outside of dining | 202326195 |
| 22A | | 202326196 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

EnviroQuest 202303498

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray ext. door caulking Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-S02-23A | Dining room balcony door | 202326197 |
| 24A | Master bedroom balcony door | 202326198 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Gray ext. window caulking Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-S02-25A | Kitchen balcony window frame | 202326199 |
| 26A | | 202326200 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Gray 4"x4" ceramic floor tile w/ grout & mortar Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-S02-27A | Restroom 1 | 202326201 |
| 28A | Master bedroom restroom | 202326202 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

202303498

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6 - 7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Pink 4"x4" ceramic wall tile w/ grout & mortar — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-29A | restroom wall | 202326203 |
| 30A | | 202326204 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Ext. beige wall coating w/ gray cementitious material — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-31A | Dining room balcony wall | 202326205 |
| 32A | Master bedroom balcony wall | 202326206 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: gray concrete w/ coating — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-502-33A | Laundry, above ceiling, ceiling | 202326207 |
| 34A | | 202326208 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303498

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 7-7
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: concrete coating Friable ~~Non-friable~~

| Sample No. | Location |
|---|---|
| 300872.02-502-35A | Laundry, above ceiling, wall 202326209 |
| 36A | 202326210 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-502-37A | Laundry, above ceiling, wall 202326211 |
| 38A | 202326212 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
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Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303497
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326141** | **300872.02-C6-01A Door Caulking Pipe Chase C04 Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326142** | **300872.02-C6-02A Door Caulking Outside Unit 608 Main Entry** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/17/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326143** | **300872.02-C6-03A 12"x12" Tan VFT w/Tan Mastic over Concrete Coating EBSC10D** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326143** | **300872.02-C6-03A 12"x12" Tan VFT w/Tan Mastic over Concrete Coating EBSC10D** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Tan floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326143** | **300872.02-C6-03A 12"x12" Tan VFT w/Tan Mastic over Concrete Coating EBSC10D** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326144** | **300872.02-C6-04A 12"x12" Tan VFT w/Tan Mastic over Concrete Coating EBSC10G** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326144** | **300872.02-C6-04A 12"x12" Tan VFT w/Tan Mastic over Concrete Coating EBSC10G** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Tan floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326144** | **300872.02-C6-04A 12"x12" Tan VFT w/Tan Mastic over Concrete Coating EBSC10G** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326145** | **300872.02-C6-05A Gray Concrete Under VFT** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326146** | **300872.02-C6-06A Gray Concrete Under VFT** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326147** | **300872.02-C6-07A 12"x12" Off White VFT w/Gray Mastic over Gray Concrete Coating Stairwell** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326147** | **300872.02-C6-07A 12"x12" Off White VFT w/Gray Mastic over Gray Concrete Coating Stairwell** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Off-white floor tile | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326147** | **300872.02-C6-07A 12"x12" Off White VFT w/Gray Mastic over Gray Concrete Coating Stairwell** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Off-white mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326148** | **300872.02-C6-08A 12"x12" Off White VFT w/Gray Mastic over Gray Concrete Coating Stairwell** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326148** | **300872.02-C6-08A 12"x12" Off White VFT w/Gray Mastic over Gray Concrete Coating Stairwell** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Off-white floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326148** | **300872.02-C6-08A 12"x12" Off White VFT w/Gray Mastic over Gray Concrete Coating Stairwell** | | NONE DETECTED | | None detected | | Calcite + binder | 4/17/2023 |
| Layer | Off-white mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326149** | **300872.02-C6-09A 2'x2' Pinhole Design Ceiling Tile EBS C10G** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/17/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |
| **202326150** | **300872.02-C6-10A 2'x2' Pinhole Design Ceiling Tile EBS C10G** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/17/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |
| **202326151** | **300872.02-C6-11A Drywall Ceiling/Soffit EBS C10G** | | NONE DETECTED | | Cellulose (undulose) | **15** | Gypsum | 4/17/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303497
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326151** | **300872.02-C6-11A Drywall Ceiling/Soffit EBS C10G** | | NONE DETECTED | | Cellulose (undulose) | **2** | Calcite + quartz + paint | 4/17/2023 |
| Layer | White joint compound / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326152** | **300872.02-C6-12A Drywall Ceiling/Soffit EBS C10G** | | NONE DETECTED | | Cellulose (undulose) | **15** | Gypsum | 4/17/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326152** | **300872.02-C6-12A Drywall Ceiling/Soffit EBS C10G** | | NONE DETECTED | | Cellulose (undulose) | **2** | Calcite + quartz + paint | 4/17/2023 |
| Layer | White joint compound / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326153** | **300872.02-C6-13A Light Brown 4" Covebase w/Tan Mastic EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326153** | **300872.02-C6-13A Light Brown 4" Covebase w/Tan Mastic EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326154** | **300872.02-C6-14A Light Brown 4" Covebase w/Tan Mastic EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/17/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326154** | **300872.02-C6-14A Light Brown 4" Covebase w/Tan Mastic EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/17/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326155** | **300872.02-C6-15A Drywall w/Joint Compound EBS C10G, Wall Base** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/17/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326156** | **300872.02-C6-16A Drywall w/Joint Compound EBS C10G, Wall Base** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/17/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326157** | **300872.02-C6-17A Tan Gasket Storage C09, Fire Supppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/17/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326158** | **300872.02-C6-18A Tan Gasket Storage C09, Fire Supppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/17/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326159** | **300872.02-C6-19A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C04 Elbow** | | NONE DETECTED | | Synthetic fibers (undulose) | | Foil | 4/17/2023 |
| Layer | Silver foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326159** | **300872.02-C6-19A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C04 Elbow** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/17/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326160** | **300872.02-C6-20A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C04 Run** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **50** | Foil | 4/17/2023 |
| Layer | Silver foil wrap | | | | | | | |
| Comments | | | | | | | | |

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**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326160** | **300872.02-C6-20A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C04 Run** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/17/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326161** | **300872.02-C6-21A Red Pipe Sealant, Mech and Elec C08** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Glass + binder + other | 4/17/2023 |
| Layer | Red pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326162** | **300872.02-C6-22A Red Pipe Sealant, Mech and Elec C08** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Glass + binder + other | 4/17/2023 |
| Layer | Red pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326163** | **300872.02-C6-23A Silver Painted Black AC Duct Joint Sealant, Storage C07** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/17/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326164** | **300872.02-C6-24A Silver Painted Black AC Duct Joint Sealant, Storage C07** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/17/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326165** | **300872.02-C6-25A Silver Painted Tan AC Duct Joint Gasket, Storage C07** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **75** | Paint | 4/17/2023 |
| Layer | Yellow gasket / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326166** | **300872.02-C6-26A Silver Painted Tan AC Duct Joint Gasket, Storage C07** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **75** | Paint | 4/17/2023 |
| Layer | Yellow gasket / silver paint | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326167** | **300872.02-C6-27A Gray Concrete w/Concrete Coating, Hallway, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326167** | **300872.02-C6-27A Gray Concrete w/Concrete Coating, Hallway, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326168** | **300872.02-C6-28A Gray Concrete w/Concrete Coating, Hallway, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326168** | **300872.02-C6-28A Gray Concrete w/Concrete Coating, Hallway, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326169** | **300872.02-C6-29A Concrete Coating, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326170** | **300872.02-C6-30A Concrete Coating, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326171** | **300872.02-C6-30A2 Concrete Coating, Stairwell Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/17/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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98-029 Hekaha Street, Suite 21
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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303497
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326172** | **300872.02-C6-31A Gray Concrete, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326173** | **300872.02-C6-31A2 Gray Concrete, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326174** | **300872.02-C6-32A Gray Concrete, Stairwell Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/17/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

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202303497
Common Area 6th Fl.

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 1-5
DATE: 4/3/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Door caulking
Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-01A | Pipe chase C04 door | 202326141 |
| ↓ 02A | Outside unit 608 main entry | 202326142 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: 12"x12" tan VFT w/ tan mastic over concrete coating
Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-03A | EBSC10D | 202326143 |
| ↓ 04A | EBSC10G | 202326144 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☒ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher<br>Kayla Maher | Received By/Date/Time: 04-12-23 A10:56 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR* >*10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR* < *10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

202303497

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# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2-5

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray concrete Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C6-05A | 202326145 |
| 06A | 202326146 |
| | |
| | |
| | X under X VFT |
| | |
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: 12"x12" off-white VFT w/ gray mastic over gray concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C6-07A | Stairwell 202326147 |
| 08A | 202326148 |
| | |
| | |
| | |
| | |
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: 2'x2' pinhole design ceiling tile Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C6-09A | EBS C10G 202326149 |
| 10A | 202326150 |
| | |
| | |
| | |
| | |
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

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# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3 - 8

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall ceiling/soffit — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-11A | EBS C10G | 202326151 |
| -12A | | 202326152 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Light brown 4" corebase w/ tan mastic — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-13A | EBS C10G, wall base | 202326153 |
| 14A | | 202326154 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Drywall w/ joint compound — Friable / Non-friable (circled: Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-15A | EBS C10G, wall | 202326155 |
| 16A | | 202326156 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

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202303497

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4-5
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Tan gasket — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-17A | Storage C09, fire ~~supply line~~ suppression pipe | 202326157 |
| 18A | | 202326158 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver foil wrap w/ yellow fiberglass insulation — Friable / Non-friable (Friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-19A | Pipe chase C04 Elbow | 202326159 |
| 20A | Pipe chase C04 Run | 202326160 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☒ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Red pipe sealant — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-21A | Mech + Elec C08 | 202326161 |
| 22A | | 202326162 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303497

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# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5 - 5
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: silver painted black AC duct joint sealant Friable Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-23A | storage C07 | 202326163 |
| 24A | | 202326164 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: silver painted tan AC duct joint ~~[illegible]~~ gasket Friable Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-25A | Storage C07 | 202326165 |
| 26A | | 202326166 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☒ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☒ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☒ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☒ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☒ Minimal Damage |

Material Description: Gray concrete w/ concrete coating Friable Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-27A | ~~Mechanical~~. Hallway, above ceiling | 202326167 |
| 28A | | 202326168 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest

202303497

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6 - 6
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: concrete coating Friable ~~Non-friable~~

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-29A | Mechanical room wall, | 202326169 |
| -30A | | 202326170 |
| -30A2 | stairwell wall | 202326171 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: gray concrete Friable Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C6-31A | Mechanical room wall | 202326172 |
| -32A | | 202326173 |
| -32A2 | stairwell wall | 202326174 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303502
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C7 (7th Common), 4/4/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326271** | **300872.02-C7-01A Door Caulking, Pipe Chase C03** | | NONE DETECTED | | None detected | | Binder | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326271** | **300872.02-C7-01A Door Caulking, Pipe Chase C03** | | NONE DETECTED | | None detected | | Paint + calcite | 4/18/2023 |
| Layer | Off-white paint / skim coat | | | | | | | |
| Comments | | | | | | | | |
| **202326272** | **300872.02-C7-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10G Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326272** | **300872.02-C7-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10G Floor** | | NONE DETECTED | | None detected | | Vinyl | 4/18/2023 |
| Layer | Tan vinyl floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326272** | **300872.02-C7-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10G Floor** | | NONE DETECTED | | None detected | | Binder | 4/18/2023 |
| Layer | Yellow mastic | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303502
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C7 (7th Common), 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326273** | **300872.02-C7-03A Gray Concrete, EBS C10G Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326274** | **300872.02-C7-04A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326274** | **300872.02-C7-04A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwall** | | NONE DETECTED | | None detected | | Vinyl | 4/18/2023 |
| Layer | Off-white vinyl floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326274** | **300872.02-C7-04A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwall** | | NONE DETECTED | | None detected | | Binder | 4/18/2023 |
| Layer | Yellow mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326275** | **300872.02-C7-05A 2'x2' Pinhole Design Ceiling Tile, Hallway Ceiling** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **90** | Calcite + other | 4/18/2023 |
| Layer | Off-white acoustic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326276** | **300872.02-C7-06A Drywall Ceiling/Soffit, Hallway Adjacent to EBS C10G** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum | 4/18/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326276** | **300872.02-C7-06A Drywall Ceiling/Soffit, Hallway Adjacent to EBS C10G** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Calcite + quartz + paint | 4/18/2023 |
| Layer | White joint compound / off-white paint | | | | | | | |
| Comments | | | | | | | | |

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303502
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C7 (7th Common), 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326277** | **300872.02-C7-07A Light Brown 4" Covebase w/Tan Mastic, EBS C10G Wall Base** | | NONE DETECTED | | None detected | | Vinyl | 4/18/2023 |
| Layer | Brown cove base | | | | | | | |
| Comments | | | | | | | | |
| **202326277** | **300872.02-C7-07A Light Brown 4" Covebase w/Tan Mastic, EBS C10G Wall Base** | | NONE DETECTED | | None detected | | Binder + paint | 4/18/2023 |
| Layer | Yellow mastic / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326278** | **300872.02-C7-08A Drywall w/Joint Compound, EBS C10G Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / off-white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326279** | **300872.02-C7-09A Tan Gasket, Storage C09 Fire Suppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) | **10** | Other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326280** | **300872.02-C7-10A Silver Foil Wrap w/Yellow Fiberglass Insulation,** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **65** | Other | 4/18/2023 |
| Layer | Foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326280** | **300872.02-C7-10A Silver Foil Wrap w/Yellow Fiberglass Insulation,** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326281** | **300872.02-C7-11A Red Pipe Sealant, Mech Room C08** | | NONE DETECTED | | Fibrous glass (amorphous) | **15** | Other + quartz | 4/18/2023 |
| Layer | Red sealant | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303502
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C7 (7th Common), 4/4/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326282** | **300872.02-C7-12A Silver Painted Black AC Duct Joint Sealant, Mech Room C08 AC Duct** | | NONE DETECTED | | None detected | | Other + paint | 4/18/2023 |
| Layer | Black sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326283** | **300872.02-C7-13A Silver Painted Tan AC Duct Joint Gasket, Storage C07 AC Duct** | | NONE DETECTED | | None detected | | Paint + other | 4/18/2023 |
| Layer | Silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326283** | **300872.02-C7-13A Silver Painted Tan AC Duct Joint Gasket, Storage C07 AC Duct** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **95** | Calcite | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326284** | **300872.02-C7-14A Gray Concrete w/Coating, Hallway Ceiling, above Ceiling Tile** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326285** | **300872.02-C7-15A Concrete Coating, Mech Room C08 Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326286** | **300872.02-C7-16A Gray Concrete, Mech Room C08 Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303502
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, C7 (7th Common), 4/4/23

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General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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C7 (7th common)

EnviroQuest

202303502

**PLM DATA SHEET**

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 1
DATE: 4/4/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Door caulking — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-01A | pipe chase C03 202326271 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"X12" tan vinyl floor tile w/ tan mastic over concrete coating — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-02A | EBS CIOG floor 202326272 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| | | |
|---|---|---|
| Sampled By: Landon Awada, Jesus Sacramento | Relinquished By/Date/Time: L. Awada 4/12/23 | Relinquished By/Date/Time: |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher | Received By/Date/Time: 04-12-23A11:00 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest

202303502

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray concrete Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-C7-03A | EBS C10G floor 202326273 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"x12" off white vinyl floor tile w/ gray mastic over gray concrete coating Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-04A | Stairwall 202326274 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 2'x2' pinhole design ~~cet~~ ceiling tile Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-05A | Hallway ceiling 202326275 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303502

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall ceiling / soffit — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-~~07A~~ 06A | Hallway Adjacent to EBS C10G 202326276 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Light brown 4" covebase w/ tan mastic — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-~~08A~~ -07A | EBS C10G wall base 202326277 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Drywall w/ joint compound — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-08A | EBS C10G Wall 202326278 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303502

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Tan gasket Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-09A | Storage C09 fire suppression pipe 202326279 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver foil wrap w/ yellow fiber glass insulation Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-10A | 202326280 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Red pipe sealant Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-11A | Mech room C08 202326281 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303502

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver painted black AC duct joint sealant — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-12A | MECH room C08 AC duct 202326282 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver painted tan AC duct joint gasket — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-13A | Storage C07 AC duct 202326283 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete w/ coating — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-14A | Hallway ceiling, Above ceiling tile 202326284 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303502

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-15A | MECH room C08 wall 202326285 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C7-16A | MECH room C08 wall 202326286 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303506
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, 8th Common (C8), 4/6/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326379** | **300872.02-C8-01A Door Caulking, Unit 808 Hallway Door** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326380** | **300872.02-C8-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10G Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326380** | **300872.02-C8-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10G Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Tan floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326380** | **300872.02-C8-02A 12"x12" Tan Vinyl Floor Tile w/Tan Mastic over Concrete Coating, EBS C10G Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326381** | **300872.02-C8-03A Gray Concrete, EBS C10G Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Your Project:** 300872.02, Repair Courtney Tower 4511, 8th Common (C8), 4/6/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326382** | **300872.02-C8-04A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell, Floor** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326382** | **300872.02-C8-04A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell, Floor** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Gray mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326382** | **300872.02-C8-04A 12"x12" Off White Vinyl Floor Tile w/Gray Mastic over Gray Concrete Coating, Stairwell, Floor** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Off-white floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326383** | **300872.02-C8-05A 2'x2' Pinhole Design Ceiling Tile, Hallway** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **55** | Perlite + calcite + other | 4/18/2023 |
| Layer | White/gray ceiling tile | | | | | | | |
| Comments | | | | | | | | |
| **202326384** | **300872.02-C8-06A Drywall Ceiling/Soffit, Hallway Ouside EBS C10G** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum | 4/18/2023 |
| Layer | White drywall | | | | | | | |
| Comments | | | | | | | | |
| **202326384** | **300872.02-C8-06A Drywall Ceiling/Soffit, Hallway Ouside EBS C10G** | | NONE DETECTED | | Cellulose (undulose) | **3** | Calcite + quartz + paint | 4/18/2023 |
| Layer | White joint compound / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326385** | **300872.02-C8-07A Light Brown 4" Covebase with Tan Mastic, EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303506
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, 8th Common (C8), 4/6/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326385** | **300872.02-C8-07A Light Brown 4" Covebase with Tan Mastic, EBS C10G, Wall Base** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326386** | **300872.02-C8-08A Drywall w/Joint Compound, EBS C10G, Wall** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326387** | **300872.02-C8-09A Tan Gasket, Storage C09, Fire Suppression Pipe** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326388** | **300872.02-C8-10A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C04 Pipe Insulation, Run** | | NONE DETECTED | | Fibrous glass (amorphous) | **15** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326388** | **300872.02-C8-10A Silver Foil Wrap w/Yellow Fiberglass Insulation, Pipe Chase C04 Pipe Insulation, Run** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326389** | **300872.02-C8-11A Red Pipe Sealant, Mechanical Room C08** | | NONE DETECTED | | Fibrous glass (amorphous) | **10** | Glass + binder + other | 4/18/2023 |
| Layer | Red pipe sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326390** | **300872.02-C8-12A Silver Painted Black AC Duct Joint Sealant, Storage C07** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/18/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303506
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, 8th Common (C8), 4/6/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326391** | **300872.02-C8-13A Silver Painted Tan AC Duct Joint Sealant, Storage C07** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **75** | Paint | 4/18/2023 |
| Layer | Tan gasket / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326392** | **300872.02-C8-14A Gray Concrete w/Coating, Hallway, above Drop Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete / coating | | | | | | | |
| Comments | | | | | | | | |
| **202326393** | **300872.02-C8-15A Concrete Coating, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326394** | **300872.02-C8-16A Gray Concrete, Mechanical Room Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303506
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, 8th Common (C8), 4/6/23

General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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EnviroQuest 202303506

**PLM DATA SHEET**

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1/6
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Door caulking Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-01A | Unit 808 ~~ex~~ hallway door 202326379 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| **OVERALL POTENTIAL RATING** | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"x12" tan vinyl floor tile w/ tan mastic over concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-02A | EBS C10G Floor 202326380 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| **OVERALL POTENTIAL RATING** | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada 4/12/23 | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher Kayla Maher | Received By/Date/Time: 04-12-23A11:03 RCVD |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 $ft^2$ = 3 Samples | 1,000 – 5,000 $ft^2$ = 5 Samples | >5,000 $ft^2$ = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or $ft^2$ = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest 202303506

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2/6
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: GRAY CONCRETE Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-03A | EBS C10G Floor 202326381 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 12"x12" offwhite vinyl floor tile w/ gray mastic over gray concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-04A | Stairwell, floor 202326382 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: 2'x2' pinhole disign ceiling tile Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-05A | Hallway 202326383 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303506

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 3/6
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Drywall ceiling / soffit — Friable / (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C8-06A | Hallway outside ~~EBS~~ EBS C10G | 202326384 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Light brown 4" covebase with tan mastic — Friable / (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C8-07A | EBS C10G, wall base | 202326385 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Drywall w/ joint compound — Friable / (Non-friable)

| Sample No. | Location | |
|---|---|---|
| 300872.02-C8-08A | EBS C10G, wall | 202326386 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303506

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4/6
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Tan gasket Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-C8-09A | Storage C09, Fire Suppression Pipe 202326387 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver foil wrap w/ yellow fiberglass insulation Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-10A | pipe chase C04 pipe insulation, run 202326388 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Red pipe sealant Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-11A | Mechanical Room C08 202326389 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303506

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 5/6
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver painted black AC duct joint sealant Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C8-12A | ~~Stora~~ Storage CO7 | 202326390 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver painted tan AC duct joint gasket Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C8-13A | Storage CO7 | 202326391 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete w/coating Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-C8-14A | Hallway, Above drop ceiling | 202326392 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

202303506

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6/6

DATE: 4/6/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: ~~Gray coating~~ Concrete coating Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-15A | Mechanical Room WA11 202326393 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Gray concrete Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-C8-16A | Mechanical Room Wall 202326394 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Friable Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303508
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 908, 4/7/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326411** | **300872.02-908-01A 12"x12" Beige Vinyl Floor Tile w/Tan Mastic and Gray Concrete Coating, Kitchen Area** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Beige floor tile | | | | | | | |
| Comments | | | | | | | | |
| **202326411** | **300872.02-908-01A 12"x12" Beige Vinyl Floor Tile w/Tan Mastic and Gray Concrete Coating, Kitchen Area** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326411** | **300872.02-908-01A 12"x12" Beige Vinyl Floor Tile w/Tan Mastic and Gray Concrete Coating, Kitchen Area** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326412** | **300872.02-908-02A Gray Coating, Kitchen Area Underneath Floor Tile and Gray Concrete Coating** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326413** | **300872.02-908-03A Door Caulking, Master Bedroom Bathroom** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |

**Hawaii Analytical Laboratory is a NIST NVLAP accredited laboratory (NVLAP Lab Code 200655-0) and is accredited in accordance with the recognized ISO/ IEC 17025:2017. Controlled doc.: Asbestos Report, rev. 3 – 20200630**

EnviroQuest, Inc.
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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303508
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 908, 4/7/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326414** | **300872.02-908-04A Window Caulking, Bedroom 2** | | NONE DETECTED | | None detected | | Calcite + binder | 4/18/2023 |
| Layer | White caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326415** | **300872.02-908-05A Light Brown Covebase w/Tan Mastic, Hallway Closet** | | NONE DETECTED | | None detected | | Calcite + vinyl | 4/18/2023 |
| Layer | Light brown covebase | | | | | | | |
| Comments | | | | | | | | |
| **202326415** | **300872.02-908-05A Light Brown Covebase w/Tan Mastic, Hallway Closet** | | NONE DETECTED | | None detected | | Binder + other | 4/18/2023 |
| Layer | Tan mastic | | | | | | | |
| Comments | | | | | | | | |
| **202326416** | **300872.02-908-06A Drywall w/Joint Compound, Master Bedroom Closet** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326417** | **300872.02-908-07A Drywall Ceiling Soffit, Master Bedroom Ceiling** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **15** | Gypsum + paint | 4/18/2023 |
| Layer | White drywall / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326418** | **300872.02-908-08A Black Sink Undercoat, Kitchen Sink** | | NONE DETECTED | | Cellulose (undulose) | **12** | Tar + calcite + quartz | 4/18/2023 |
| Layer | Black sink undercoat | | | | | | | |
| Comments | | | | | | | | |
| **202326419** | **300872.02-908-09A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen Area; Under Sink Cabinet** | | NONE DETECTED | | Cellulose (undulose) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |

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**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303508
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 908, 4/7/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326419** | **300872.02-908-09A Silver Paper Foil Wrap w/Yellow Fiberglass Insulation, Kitchen Area; Under Sink Cabinet** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326420** | **300872.02-908-10A Gray Sealant, Balcony Railing Base/Post Sealant** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray sealant | | | | | | | |
| Comments | | | | | | | | |
| **202326421** | **300872.02-908-11A Gray Exterior Door Caulking, Balcony Sliding Door Sealant Frame** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326422** | **300872.02-908-12A Gray Exterior Window Caulking, Bedroom 3** | | NONE DETECTED | | None detected | | Calcite + binder + other | 4/18/2023 |
| Layer | Gray caulk | | | | | | | |
| Comments | | | | | | | | |
| **202326423** | **300872.02-908-13A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Bathroom** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Gray ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326423** | **300872.02-908-13A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Bathroom** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326423** | **300872.02-908-13A Gray 4"x4" Ceramic Floor Tile w/Grout and Mortar, Master Bedroom Bathroom** | | NONE DETECTED | | None detected | | Calcite | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303508
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 908, 4/7/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326424** | **300872.02-908-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hall Bathroom; Shower** | | NONE DETECTED | | None detected | | Tar | 4/18/2023 |
| Layer | Black tar | | | | | | | |
| Comments | | | | | | | | |
| **202326424** | **300872.02-908-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hall Bathroom; Shower** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray mortar | | | | | | | |
| Comments | | | | | | | | |
| **202326424** | **300872.02-908-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hall Bathroom; Shower** | | NONE DETECTED | | None detected | | Ceramic + quartz | 4/18/2023 |
| Layer | Pink ceramic tile | | | | | | | |
| Comments | | | | | | | | |
| **202326424** | **300872.02-908-14A Pink 4"x4" Ceramic Wall Tile w/Grout and Mortar and Black Tar, Hall Bathroom; Shower** | | NONE DETECTED | | None detected | | Calcite + gypsum | 4/18/2023 |
| Layer | White grout | | | | | | | |
| Comments | | | | | | | | |
| **202326425** | **300872.02-908-15A Exterior Beige Wall Coating w/Gray Cementitious Materials, Balcony Exterior Wall** | | NONE DETECTED | | Cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326425** | **300872.02-908-15A Exterior Beige Wall Coating w/Gray Cementitious Materials, Balcony Exterior Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |

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**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 908, 4/7/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326426** | **300872.02-908-16A Silver Cloth Wrap w/Brown Fiberglass Insulation, Kitchen Area; Exhaust Fan** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Brown insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326426** | **300872.02-908-16A Silver Cloth Wrap w/Brown Fiberglass Insulation, Kitchen Area; Exhaust Fan** | | NONE DETECTED | | Synthetic fibers (undulose) | **20** | Foil | 4/18/2023 |
| Layer | Silver cloth wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326427** | **300872.02-908-17A Gray Concrete w/Concrete Coating, Laundry, Above Ceiling, Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326427** | **300872.02-908-17A Gray Concrete w/Concrete Coating, Laundry, Above Ceiling, Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326428** | **300872.02-908-18A Concrete Coating, Laundry Wall, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite + paint | 4/18/2023 |
| Layer | Gray concrete coating / white paint | | | | | | | |
| Comments | | | | | | | | |
| **202326429** | **300872.02-908-19A Gray Concrete, Laundry Wall, above Ceiling** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303508
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Unit 908, 4/7/23

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General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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Unit 908

EnviroQuest 202303508

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: 12"x12" beige vinyl floor tile w/ tan mastic + gray concrete coating Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-908-01A | Kitchen area 202326411 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☑ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Gray concrete Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-908-02A | Kitchen area 202326412 underneath floor tile & gray concrete coating |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| | | |
|---|---|---|
| Sampled By: Landon Awada, Jesus Sacramento | Relinquished By/Date/Time: L. Awada 4/12/23 | Relinquished By/Date/Time: |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher | Received By/Date/Time: 04-12912P009 3-ARNV |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = >*10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = < *10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest 202303508

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Door caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-~~809~~ 908-03A | Master bedroom bathroom 202326413 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Window caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-04A | Bedroom 2 202326414 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Light brown covebase w/ tan mastic — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-05A | Hallway closet 202326415 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

202303508

EnviroQuest

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Drywall w/ joint compound — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-908-06A | Master bedroom closet | 202326416 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Drywall ceiling / soffit — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-908-07A | Master bedroom ceiling | 202326417 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Black sink undercoat — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-908-08A | Kitchen sink | 202326418 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

EnviroQuest

202303508

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver paper foil wrap w/ yellow fiberglass insulation — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-908-09A | Kitchen Area; under sink cabinet 202326419 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☑ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Gray sealant — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-908-10A | Balcony railing base/post sealant 202326420 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Gray exterior door caulking — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-908-11A | Balcony sliding door sealant frame 202326421 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303508

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 5
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: Gray exterior window caulking — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-12A | Bedroom 3 202326422 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Gray 4"x4" ceramic floor tile w/ grout + mortar — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-13A | Master bedroom bathroom 202326423 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: pink 4"x4" ceramic wall tile w/ grout + mortar + black tar — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-14A | Hall bathroom; Shower 202326424 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

EnviroQuest 202303508

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 6
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Exterior beige wall coating w/ gray cementitious materials — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-15A | Balcony exterior wall 202326425 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: Silver cloth wrap w/ brown fiberglass insulation — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-16A | kitchen area; exhaust fan 202326426 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

Material Description: gray concrete w/ concrete coating — Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-17A | Laundry, above ceiling, ceiling 202326427 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☑ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☑ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☑ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☑ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☑ Minimal Damage |

EnviroQuest 202303508

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 7
DATE: 4/7/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

Material Description: concrete coating
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-18A | ~~[illegible]~~ 202326428 |
| | Laundry wall, above ceiling |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete
Friable / Non-friable (Non-friable circled)

| Sample No. | Location |
|---|---|
| 300872.02-908-19A | Laundry wall, above ceiling 202326429 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description:
Friable / Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303507
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Roof and Lower Roof, 4/6/23

## Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326395** | **300872.02-R-01A Exterior Beige Wall Coating w/Gray Cementitious Material, Exterior Wall** | | NONE DETECTED | | Polypropylene (undulose) + cellulose (undulose) | **2** | Paint + calcite + binder | 4/18/2023 |
| Layer | Beige wall coating | | | | | | | |
| Comments | | | | | | | | |
| **202326395** | **300872.02-R-01A Exterior Beige Wall Coating w/Gray Cementitious Material, Exterior Wall** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray cementitious material | | | | | | | |
| Comments | | | | | | | | |
| **202326396** | **300872.02-R-02A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Northwest Wing Roof** | | NONE DETECTED | | Fibrous glass (amorphous) | **50** | Tar | 4/18/2023 |
| Layer | Black tar / felt | | | | | | | |
| Comments | | | | | | | | |
| **202326396** | **300872.02-R-02A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Northwest Wing Roof** | | NONE DETECTED | | None detected | | Quartz + binder + other | 4/18/2023 |
| Layer | Gray rubbery coat | | | | | | | |
| Comments | | | | | | | | |
| **202326397** | **300872.02-R-03A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Northeast Wing Roof** | | NONE DETECTED | | Fibrous glass (amorphous) | **50** | Tar | 4/18/2023 |
| Layer | Black tar / felt | | | | | | | |
| Comments | | | | | | | | |

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# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326397** | **300872.02-R-03A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Northeast Wing Roof** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326397** | **300872.02-R-03A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Northeast Wing Roof** | | NONE DETECTED | | None detected | | Quartz + binder + other | 4/18/2023 |
| Layer | Gray rubbery coat | | | | | | | |
| Comments | | | | | | | | |
| **202326398** | **300872.02-R-04A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Southeast Wing Roof** | | NONE DETECTED | | Fibrous glass (amorphous) | **50** | Tar | 4/18/2023 |
| Layer | Black tar / felt | | | | | | | |
| Comments | | | | | | | | |
| **202326398** | **300872.02-R-04A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Southeast Wing Roof** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326398** | **300872.02-R-04A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Southeast Wing Roof** | | NONE DETECTED | | None detected | | Quartz + binder + other | 4/18/2023 |
| Layer | Gray rubbery coat | | | | | | | |
| Comments | | | | | | | | |
| **202326399** | **300872.02-R-05A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Southwest Wing Roof** | | NONE DETECTED | | Fibrous glass (amorphous) | **50** | Tar | 4/18/2023 |
| Layer | Black tar / felt | | | | | | | |
| Comments | | | | | | | | |
| **202326399** | **300872.02-R-05A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Southwest Wing Roof** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303507
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Roof and Lower Roof, 4/6/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326399** | **300872.02-R-05A Gray Felt over Cloth Mesh w/Black Tar over Concrete, Southwest Wing Roof** | | NONE DETECTED | | None detected | | Quartz + binder + other | 4/18/2023 |
| Layer | Gray rubbery coat | | | | | | | |
| Comments | | | | | | | | |
| **202326400** | **300872.02-R-06A Tan Gasket, Storage P03** | | NONE DETECTED | | Synthetic fibers (undulose) + fibrous glass (amorphous) | **50** | Calcite + other | 4/18/2023 |
| Layer | Tan gasket | | | | | | | |
| Comments | | | | | | | | |
| **202326401** | **300872.02-R-07A Silver Painted Black AC Duct Joint Sealant, Mechanical Room P04** | | NONE DETECTED | | None detected | | Calcite + binder + paint | 4/18/2023 |
| Layer | Black joint sealant / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326402** | **300872.02-R-08A Silver Paper Foil Wrap w/Yellow Fiberglass Pipe Insulation, Mechanical Room P01** | | NONE DETECTED | | Cellulose (undulose) + fibrous glass (amorphous) | **50** | Foil | 4/18/2023 |
| Layer | Silver paper foil wrap | | | | | | | |
| Comments | | | | | | | | |
| **202326402** | **300872.02-R-08A Silver Paper Foil Wrap w/Yellow Fiberglass Pipe Insulation, Mechanical Room P01** | | NONE DETECTED | | Fibrous glass (amorphous) | > **99** | None detected | 4/18/2023 |
| Layer | Yellow insulation | | | | | | | |
| Comments | | | | | | | | |
| **202326403** | **300872.02-R-09A Silver Painted Yellow AC Duct Joint Gasket, Mechanical Room P01** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **75** | Paint | 4/18/2023 |
| Layer | Yellow gasket / silver paint | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303507
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Roof and Lower Roof, 4/6/23

# Bulk Asbestos Determination

| Sample No. | Your Sample ID / Description | Asbestos Present? | Type | %v/v | Other Fibrous | %v/v | Matrix | Date Analyzed |
|---|---|---|---|---|---|---|---|---|
| **202326404** | **300872.02-R-10A Silver Painted Yellow AC Duct Joint Gasket, Mechanical Room P01** | | NONE DETECTED | | Fibrous glass (amorphous) + cellulose (undulose) | **75** | Paint | 4/18/2023 |
| Layer | Yellow gasket / silver paint | | | | | | | |
| Comments | | | | | | | | |
| **202326405** | **300872.02-R-11A Concrete Coating, Mechanical Room P04** | | NONE DETECTED | | None detected | | Calcite + quartz + perlite | 4/18/2023 |
| Layer | Gray concrete coating | | | | | | | |
| Comments | | | | | | | | |
| **202326406** | **300872.02-R-12A Gray Concrete, Mechanical Room P04** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326407** | **300872.02-R-13A Gray Concrete Roof Coating, Lower Roof, Outside Unit 201** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326408** | **300872.02-R-14A Gray Concrete Roof Coating, Lower Roof, Outside Unit 201** | | NONE DETECTED | | None detected | | Calcite + quartz | 4/18/2023 |
| Layer | Gray concrete | | | | | | | |
| Comments | | | | | | | | |
| **202326409** | **300872.02-R-15A Beige Roof Tile Grout, Lower Roof, Outside Unit 201, Between Clay Roof Tile** | | NONE DETECTED | | None detected | | Gypsum + calcite + other | 4/18/2023 |
| Layer | Beige roof tile grout | | | | | | | |
| Comments | | | | | | | | |
| **202326410** | **300872.02-R-16A Beige Roof Tile Grout, Lower Roof, Outside Unit 201, Between Clay Roof Tile** | | NONE DETECTED | | None detected | | Gypsum + calcite + other | 4/18/2023 |
| Layer | Beige roof tile grout | | | | | | | |
| Comments | | | | | | | | |

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**Lab Job No:** 202303507
**Date Submitted:** 4/12/2023
**Your Project:** 300872.02, Repair Courtney Tower 4511, Roof and Lower Roof, 4/6/23

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General Comments
The bulk sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures outlined in the United States Environmental Protection Agency's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (EPA-600/M4-82-020, Dec. 1982) and / or "Method for Determination of Asbestos in bulk Building Materials" (EPA-600/R-93-116, July 1993). The analysis of each bulk sample relates only to the material examined, and may or may not represent the overall composition of its original source. Floor tile and other resinously bound materials, when analyzed by the EPA methods referenced above may yield false negative results because of limitations in separating closely bound fibers and in detecting fibers of small length and diameter. Alternative methods of identification, including Transmission Electron Microscopy (TEM) may or may not be applicable. We utilize calibrated visual area estimation on a routine basis and do not conduct point counting unless specifically requested to do so. Estimated error for the visual determinations presented are 75% relative (1 to 2%), 50% relative (3 to 5%); 25% relative (6 to 25%) and 20% (>26% v/v). We will not separate layers which in our opinion are not readily discernable. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Governement. Unless otherwise indicated, the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
None Detected = asbestos was not observed in the sample. If trace amount of asbestos was detected below our quantifiable limits of 1.0%, <1% (trace) would be indicated and the asbestos type listed. Point counting, where applicable, are recommended to improve accuracy.

**Jennifer Hsu Liao**
**Laboratory Manager**

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EnviroQuest 202303507 ROOF + lower roof

**PLM DATA SHEET**

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 1
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Exterior Beige wall coati~~ng~~ng w/ gray cementitious material Friable ~~Non-friable~~

| Sample No. | Location | |
|---|---|---|
| 300872.02-R-01A | Exterior wall | 202326395 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray felt over cloth mesh w/ black tar over concrete Friable ~~Non-friable~~

| Sample No. | Location | |
|---|---|---|
| 300872.02-R-02A | Northwest wing roof | 202326396 |
| 03A | North east wing roof | 202326397 |
| 04A | South east wing roof | |
| 05A | South west wing roof | 202326398 |
| | | 202326399 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

| Sampled By: | Relinquished By/Date/Time: | Relinquished By/Date/Time: |
|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada | |
| Delivered to Lab By: | Received By/Date/Time: Kayla Maher<br>Kayla Maher | Received By/Date/Time:<br>04-12-23A009 3-ARNV |

**TURNAROUND TIME:** ☐ < 12 Hours ☐ 24 Hours ☒ 3 Days ☐ 5 Days ☐ _____

| | | | |
|---|---|---|---|
| Surfacing | <1,000 ft² = 3 Samples | 1,000 – 5,000 ft² = 5 Samples | >5,000 ft² = 7 Samples |
| TSI | Minimum of 3 Samples UNLESS…. | <6 In. or ft² = 1 Sample | Minimum of 2 Samples *(Cement/plaster valves, elbows & 'T')* |
| Misc. Non-Friable | Minimum of 2 Samples (*AHERA*) | Minimum of 3 Samples (*Hawaii*) | |
| Misc. Friable | Minimum of 2 Samples | | |

| | | | |
|---|---|---|---|
| Surfacing | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |
| TSI | Sig. Damage = *>10% Missing Jacket OR >10% Dist. or 25% Local* | Damaged = *< 10% Missing Jacket OR < 10% Dist. or 25% Local* | Good = *Very Limited Damage* |
| Misc | Sig. Damage = > *10% Dist. or 25% Local* | Damaged = < *10% Dist. or 25% Local* | *Good = Very Limited Damage* |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

EnviroQuest 202303507

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Tan gasket Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-R-06A | Storage P03 202326400 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver painted Black AC duct joint ~~selant~~ sealant Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-R-07A | Mechanical Room P04 202326401 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Silver paper foil wrap w/ yellow fiberglass pipe insulation Friable Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-R-08A | Mechanical Room P01 202326402 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303507

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 3
DATE: 4/6/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Silver painted yellow Ac duct joint gasket — Friable / Non-friable (Non-friable circled)

| Sample No. | Location | |
|---|---|---|
| 300872.02-R-09A | mechanical room P01 | 202326403 |
| 10A | | 202326404 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: ~~concrete~~ concrete coating — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-R-11A | Mechanical room P04 | 202326405 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: gray concrete — Friable / Non-friable

| Sample No. | Location | |
|---|---|---|
| 300872.02-R-12A | Mechanical room P04 | 202326406 |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

EnviroQuest 202303507

# PLM DATA SHEET

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 4
DATE:
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

Material Description: Gray concrete roof coating — Friable / Non-friable

| Sample No. | Location |
|---|---|
| 300872.02-R-13A | Lower roof, outside unit 201 — 202326407 |
| 14A | 202326408 |

* Above multipurpose + bike storage
* Main part of the lower roof was inaccessible, but materials look the same

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: Beige roof tile grout — Friable / (Non-friable)

| Sample No. | Location |
|---|---|
| 300872.02-R-15A | Lower roof, outside unit 201, between clay roof tile |
| 16A | 202326409 |
| | 202326410 |

* Main part of lower roof inaccessible

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

Material Description: — Friable / Non-friable

| Sample No. | Location |
|---|---|
| | |

CONDITION: % Damaged: % Localized: % Distributed: Total Material Quantity:

| Surfacing Material | | TSI | | Misc. | |
|---|---|---|---|---|---|
| ☐ Sig. Damage | % Crumbling - | ☐ Sig. Damage | % Gouge/Punct - | ☐ Sig. Damage | % Crumbling - |
| ☐ Damaged | % Delaminating - | ☐ Damaged | % Crushed - | ☐ Damaged | % Delaminating - |
| ☐ Good Cond. | % $H_2O$/Gouges - | ☐ Good Cond. | % $H_2O$ Stains - | ☐ Good Cond. | % $H_2O$/Gouges- |

| | | | |
|---|---|---|---|
| Contact Potential | ☐ High | ☐ Moderate | ☐ Low |
| Vibration Potential | ☐ High | ☐ Moderate | ☐ Low |
| Air Erosion | ☐ High | ☐ Moderate | ☐ Low |
| OVERALL POTENTIAL RATING | ☐ Significant Damage | ☐ Damage | ☐ Minimal Damage |

# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303490
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

## Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326061** | **300872.02-C1-03P Int., Hallway, Baseboard, Concrete, Brown/Beige, Intact** | 0.074 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326062** | **300872.02-C1-04P Int., EBS L10B, Wall, Concrete, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326063** | **300872.02-C1-05P Int., EBS L10B, Base Board, Drywall, Brown/Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326064** | **300872.02-C1-06P Int., Mechanical Room, Motor Pumo Base, Metal, Black, Fair** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326065** | **300872.02-C1-07P Int., Mech Room, AC Duct, Metal, Silver/Yellow, Intact** | 0.13 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326066** | **300872.02-C1-08P Int., Main Mech Room, Pipe, Metal, Beige/Black, Poor** | 0.16 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326067** | **300872.02-C1-09P Int., Main Mech Room, Support Frame, Metal, Gray, Intact** | 0.22 | wt % | 4/18/2023 |
| Comments | | | | |

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**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

# Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326068** | **300872.02-C1-10P Int., Main Mech Room, Motor Pump, Metal, Blue, Fair** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326069** | **300872.02-C1-11P Int., Main Mech Room, Motor Pump, Metal, Green, Fair** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326070** | **300872.02-C1-12P Int., Main Mech Room, Railing, Metal, Green/Orange, Fair** | 1.1 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326071** | **300872.02-C1-13P Int., Mech Room, Fire Alarm Terminal Cabinet, Metal, Red, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326072** | **300872.02-C1-14P Int., Donwspout, PVC, Beige, Intact** | 0.0069 | wt % | 4/18/2023 |
| Comments | | | | |

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**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

# Total Recoverable Cadmium #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326059 | 300872.02-C1-01P Int.Flr 1, Common Area Hallway, Floor, Ceramic, Red, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326060 | 300872.02-C1-02P Int., Garbage Storage, Wall, Ceramic, Light Blue, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326061 | 300872.02-C1-03P Int., Hallway, Baseboard, Concrete, Brown/Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326062 | 300872.02-C1-04P Int., EBS L10B, Wall, Concrete, Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326063 | 300872.02-C1-05P Int., EBS L10B, Base Board, Drywall, Brown/Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326064 | 300872.02-C1-06P Int., Mechanical Room, Motor Pumo Base, Metal, Black, Fair | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326065 | 300872.02-C1-07P Int., Mech Room, AC Duct, Metal, Silver/Yellow, Intact | 15 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326066 | 300872.02-C1-08P Int., Main Mech Room, Pipe, Metal, Beige/Black, Poor | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326067 | 300872.02-C1-09P Int., Main Mech Room, Support Frame, Metal, Gray, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326068 | 300872.02-C1-10P Int., Main Mech Room, Motor Pump, Metal, Blue, Fair | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

# Total Recoverable Cadmium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326069** | **300872.02-C1-11P Int., Main Mech Room, Motor Pump, Metal, Green, Fair** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326070** | **300872.02-C1-12P Int., Main Mech Room, Railing, Metal, Green/Orange, Fair** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326071** | **300872.02-C1-13P Int., Mech Room, Fire Alarm Terminal Cabinet, Metal, Red, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326072** | **300872.02-C1-14P Int., Donwspout, PVC, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

# Total Recoverable Chromium #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326059 | 300872.02-C1-01P Int.Flr 1, Common Area Hallway, Floor, Ceramic, Red, Intact | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326060 | 300872.02-C1-02P Int., Garbage Storage, Wall, Ceramic, Light Blue, Intact | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326061 | 300872.02-C1-03P Int., Hallway, Baseboard, Concrete, Brown/Beige, Intact | 160 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326062 | 300872.02-C1-04P Int., EBS L10B, Wall, Concrete, Beige, Intact | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326063 | 300872.02-C1-05P Int., EBS L10B, Base Board, Drywall, Brown/Beige, Intact | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326064 | 300872.02-C1-06P Int., Mechanical Room, Motor Pumo Base, Metal, Black, Fair | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326065 | 300872.02-C1-07P Int., Mech Room, AC Duct, Metal, Silver/Yellow, Intact | 40000 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326066 | 300872.02-C1-08P Int., Main Mech Room, Pipe, Metal, Beige/Black, Poor | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326067 | 300872.02-C1-09P Int., Main Mech Room, Support Frame, Metal, Gray, Intact | 1500 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326068 | 300872.02-C1-10P Int., Main Mech Room, Motor Pump, Metal, Blue, Fair | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Lab Job No:** 202303490
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

## Total Recoverable Chromium #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326069 | 300872.02-C1-11P Int., Main Mech Room, Motor Pump, Metal, Green, Fair | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326070 | 300872.02-C1-12P Int., Main Mech Room, Railing, Metal, Green/Orange, Fair | 2300 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326071 | 300872.02-C1-13P Int., Mech Room, Fire Alarm Terminal Cabinet, Metal, Red, Intact | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326072 | 300872.02-C1-14P Int., Donwspout, PVC, Beige, Intact | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |

## Total Recoverable Lead #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326059 | 300872.02-C1-01P Int.Flr 1, Common Area Hallway, Floor, Ceramic, Red, Intact | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| 202326060 | 300872.02-C1-02P Int., Garbage Storage, Wall, Ceramic, Light Blue, Intact | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |

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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303490
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, C1, 4/5/23

---

**All Quality Control data are acceptable unless otherwise noted.**
**MRL for lead air is 5ug.**
**MRL for lead wipe is 10ug.**
**MRL for lead paint or soil is 40 mg/kg for a 0.25g sample.**

General Comments
The sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures associated with the ”analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sample relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. All analysts participate in interlaboratory quality control testing to continuously document profiency. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report should not be construed as an endorsement for a product or a service by the AIHA LAP, LLC or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. TWA values have been calculated based on information supplied by the client that the laboratory has not independently verified. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
# = Analytical methods marked with an "#" are not within our AIHA LAP, LLC Scope of Accreditation.
MRL = Method Reporting Limit.

**Anne Antin**
**Quality Control Manager**

EnviroQuest

202303490 C1

# Pb, Cd, Cr SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 1-1

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS<br>☐ 24 HRS | ☒ 3 DAYS<br>☐ OTHER | ☒ BULK<br>☐ SOIL | ☐ WIPE<br>☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-01P | X | | 1 | Common AREA Hallway | Floor | ceramic | RED | Intact |
| | 202326059 | | | | | | | |
| 300872.02-C1-02P | X | | | Garbage Storage | Wall | Ceramic | Light blue | intact |
| | 202326059 ~~58~~ 60 KM | | | | | | | |
| 300872.02-C1-03P | X | | | Hallway | Base board | concrete | Brown/ Beige | intact |
| | 202326059 ~~58~~ 61 KM | | | | | | | |
| 300872.02-C1-04P | X | | | EBS L10B | Wall | concrete | Beige | Intact |
| | 202326062 | | | | | | | |
| 300872.02-C1-05P | X | | | EBS L10B | Base board | Drywall | BROWN/ BEIGE | Intact |
| | 202326063 | | | | | | | |
| 300872.02-C1-06P | X | | | Main ROOM MECHANICAL ROOM | Motor pump base | Metal | Black | Fair |
| | 202326064 | | | | | | | |
| 300872.02-C1-07P | X | | | Main ROOM MECH ROOM | AC duct | Metal | Silver/ Yellow | Intact |
| | 202326065 | | | | | | | |
| 300872.02-C1-08P | X | | | Main ROOM MECH ROOM | pipe | Metal | Beige/ Black | poor |
| | 202326066 | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada | 4/12/23 | Kayla Maher<br>Kayla Maher | 04-12-23A10:44 RCVD |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

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EnviroQuest 202303490

# Pb SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 2

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

| TURNAROUND TIME | |
|---|---|
| ☐ <12 HRS | ☐ 3 DAYS |
| ☐ 24 HRS | ☐ OTHER |

| MEDIA | |
|---|---|
| ☐ BULK | ☐ WIPE |
| ☐ SOIL | ☐ OTHER |

| COMMENTS |
|---|
| |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-09P | X | | | main MECH ROOM | Support FRAME | METAL | gray | Intact |
| | 202326067 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-~~10A~~ 10P | X | | | main MECH ROOM | Motor Pump | Metal | Blue | Fair |
| | 202326068 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-11P | X | | | MAIN MECH ROOM | motor Pump | Metal | green | Fair |
| | 202326069 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-12P | X | | | main mechroom | railing | Metal | green/orange | Fair |
| | 202326070 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-13P | X | | | MECH ROOM | FIRE ALARM TERMINAL CABINET | METAL | RED | Intact |
| | 202326071 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C1-14P | | X | | | downspout | PVC | Beige | Intact |
| | 202326072 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | | | | |
| | | | | |

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# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303489
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Multi Purpose - Bike Storage, 4/5/23

## Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326053** Comments | **300872.02-MP-01P Int., Multi Room, Wall, Concrete, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| **202326054** Comments | **300872.02-MP-02P Int., Bike Storage, Wall, Drywall, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| **202326055** Comments | **300872.02-MP-03P Int., Bike Storage, Door/Door Frame, Wood, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| **202326056** Comments | **300872.02-MP-04P Int., Bike Storage, Pipe, Metal, Beige/Yellow, Poor** | 0.48 | wt % | 4/18/2023 |
| **202326057** Comments | **300872.02-MP-05P Int., Bike Storage, Fire Suppression Pipe, Metal, Red, Intact** | 0.03 | wt % | 4/18/2023 |
| **202326058** Comments | **300872.02-MP-06P Ext., Wall, Concrete, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |

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**Lab Job No:** 202303489
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Multi Purpose - Bike Storage, 4/5/23

# Total Recoverable Cadmium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326053** Comments | **300872.02-MP-01P Int., Multi Room, Wall, Concrete, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| **202326054** Comments | **300872.02-MP-02P Int., Bike Storage, Wall, Drywall, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| **202326055** Comments | **300872.02-MP-03P Int., Bike Storage, Door/Door Frame, Wood, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| **202326056** Comments | **300872.02-MP-04P Int., Bike Storage, Pipe, Metal, Beige/Yellow, Poor** | 13 | mg/kg | 4/18/2023 |
| **202326057** Comments | **300872.02-MP-05P Int., Bike Storage, Fire Suppression Pipe, Metal, Red, Intact** | < 10 | mg/kg | 4/18/2023 |
| **202326058** Comments | **300872.02-MP-06P Ext., Wall, Concrete, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |

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**Lab Job No:** 202303489
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Multi Purpose - Bike Storage, 4/5/23

## Total Recoverable Chromium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326053** Comments | **300872.02-MP-01P Int., Multi Room, Wall, Concrete, Beige, Intact** | < 79 | mg/kg | 4/18/2023 |
| **202326054** Comments | **300872.02-MP-02P Int., Bike Storage, Wall, Drywall, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| **202326055** Comments | **300872.02-MP-03P Int., Bike Storage, Door/Door Frame, Wood, Beige, Intact** | < 79 | mg/kg | 4/18/2023 |
| **202326056** Comments | **300872.02-MP-04P Int., Bike Storage, Pipe, Metal, Beige/Yellow, Poor** | 24000 | mg/kg | 4/18/2023 |
| **202326057** Comments | **300872.02-MP-05P Int., Bike Storage, Fire Suppression Pipe, Metal, Red, Intact** | < 79 | mg/kg | 4/18/2023 |
| **202326058** Comments | **300872.02-MP-06P Ext., Wall, Concrete, Beige, Intact** | < 79 | mg/kg | 4/18/2023 |

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**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Multi Purpose - Bike Storage, 4/5/23

---

**All Quality Control data are acceptable unless otherwise noted.**
**MRL for lead air is 5ug.**
**MRL for lead wipe is 10ug.**
**MRL for lead paint or soil is 40 mg/kg for a 0.25g sample.**

General Comments
The sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures associated with the ”analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sample relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. All analysts participate in interlaboratory quality control testing to continuously document profiency. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report should not be construed as an endorsement for a product or a service by the AIHA LAP, LLC or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. TWA values have been calculated based on information supplied by the client that the laboratory has not independently verified. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
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MRL = Method Reporting Limit.

**Anne Antin**
**Quality Control Manager**

Multi Purpose / Bike Storage

EnviroQuest 202303489

# Cr, Cd, Pb SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 1 ~~of~~

DATE: 4/5/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS<br>☐ 24 HRS | ☒ 3 DAYS<br>☐ OTHER | ☒ BULK<br>☐ SOIL | ☐ WIPE<br>☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-MP-01P | X | | | Multi ROOM | wall | concrete | Beige | Intact |
| 202326053 | | | | | | | | |
| 300872.02-MP-02P | X | | | Bike storage | wall | Dry wall | Beige | Intact |
| 202326054 | | | | | | | | |
| 300872.02-MP-03P | X | | | Bike storage | Door / Door FRAME | wood | Beige | Intact |
| 202326055 | | | | | | | | |
| 300872.02-MP-04P | X | | | Bike storage | pipe | Metal | Beige/ Yellow | poor |
| 202326056 | | | | | | | | |
| 300872.02-MP-05P | X | | | Bike storage | Fire Suppression pipe | Metal | Red | Intact |
| 202326057 | | | | | | | | |
| 300872.02-MP-06P | | X | | | Wall | concrete | Beige | Intact |
| 202326058 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada | 4/12/23 | Kayla Maher<br>Kayla Maher | 04-12-23 A10:44 RCVD |

**Hawaii Analytical Laboratory** Samples picked up at EQI office.

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# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
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**Phone Number:** (808)486-5881
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**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303488
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

## Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326040** | **300872.02-502-01P Int., Flr 5, Entry, Door Frame, Metal, Beige/Brown, Intact** | 0.6 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326041** | **300872.02-502-02P Int., Flr 5, Entry, Door, Metal, Brown, Intact** | 0.084 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326042** | **300872.02-502-03P Int., Flr 5, Kitchen Pantry, Door Frame, Wood, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326043** | **300872.02-502-04P Int., Flr 5, Hallway Entry, Door, Wood, Beige, Intact** | 0.079 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326044** | **300872.02-502-05P Int., Flr 5, Bedroom 3 Closet, Wall, Drywall, Off-White, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326045** | **300872.02-502-06P Int., Flr 5, Kitchen, Ceiling, Drywall, Off-White, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326046** | **300872.02-502-07P Int., Flr 5, Hallway, Wall, Concrete, Off-White, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| **202326049** | **300872.02-502-10P Int., Flr 5, Balcony, Wall, Concrete, Beige, Intact** | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |

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**Lab Job No:** 202303488
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

# Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326050** Comments | **300872.02-502-11P Int., Flr 5, Balcony, Wall, Concrete, Brown, Intact** | < 0.004 | wt % | 4/18/2023 |
| **202326051** Comments | **300872.02-502-12P Int., Flr 5, Door and Door Frame, Metal, Beige/Yellow, Fair** | 1.3 | wt % | 4/18/2023 |
| **202326052** Comments | **300872.02-502-13P Int., Flr 5, Balcony, Floor, Concrete, Brown, Poor** | 0.0073 | wt % | 4/18/2023 |

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**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

# Total Recoverable Cadmium #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326040** | **300872.02-502-01P Int., Flr 5, Entry, Door Frame, Metal, Beige/Brown, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326041** | **300872.02-502-02P Int., Flr 5, Entry, Door, Metal, Brown, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326042** | **300872.02-502-03P Int., Flr 5, Kitchen Pantry, Door Frame, Wood, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326043** | **300872.02-502-04P Int., Flr 5, Hallway Entry, Door, Wood, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326044** | **300872.02-502-05P Int., Flr 5, Bedroom 3 Closet, Wall, Drywall, Off-White, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326045** | **300872.02-502-06P Int., Flr 5, Kitchen, Ceiling, Drywall, Off-White, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326046** | **300872.02-502-07P Int., Flr 5, Hallway, Wall, Concrete, Off-White, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326047** | **300872.02-502-08P Int., Flr 5, Restroom, Wall, Ceramic, Pink, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326048** | **300872.02-502-09P Int., Flr 5, Restroom, Floor, Ceramic, Gray, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326049** | **300872.02-502-10P Int., Flr 5, Balcony, Wall, Concrete, Beige, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326050** | **300872.02-502-11P Int., Flr 5, Balcony, Wall, Concrete, Brown, Intact** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Lab Job No:** 202303488
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

# Total Recoverable Cadmium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326051** | **300872.02-502-12P Int., Flr 5, Door and Door Frame, Metal, Beige/Yellow, Fair** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326052** | **300872.02-502-13P Int., Flr 5, Balcony, Floor, Concrete, Brown, Poor** | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

# Total Recoverable Chromium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326040** | **300872.02-502-01P Int., Flr 5, Entry, Door Frame, Metal, Beige/Brown, Intact** | 6600 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326041** | **300872.02-502-02P Int., Flr 5, Entry, Door, Metal, Brown, Intact** | 520 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326042** | **300872.02-502-03P Int., Flr 5, Kitchen Pantry, Door Frame, Wood, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326043** | **300872.02-502-04P Int., Flr 5, Hallway Entry, Door, Wood, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326044** | **300872.02-502-05P Int., Flr 5, Bedroom 3 Closet, Wall, Drywall, Off-White, Intact** | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326045** | **300872.02-502-06P Int., Flr 5, Kitchen, Ceiling, Drywall, Off-White, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326046** | **300872.02-502-07P Int., Flr 5, Hallway, Wall, Concrete, Off-White, Intact** | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326047** | **300872.02-502-08P Int., Flr 5, Restroom, Wall, Ceramic, Pink, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326048** | **300872.02-502-09P Int., Flr 5, Restroom, Floor, Ceramic, Gray, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326049** | **300872.02-502-10P Int., Flr 5, Balcony, Wall, Concrete, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326050** | **300872.02-502-11P Int., Flr 5, Balcony, Wall, Concrete, Brown, Intact** | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303488
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

## Total Recoverable Chromium #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326051 | 300872.02-502-12P Int., Flr 5, Door and Door Frame, Metal, Beige/Yellow, Fair | 10000 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326052 | 300872.02-502-13P Int., Flr 5, Balcony, Floor, Concrete, Brown, Poor | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |

## Total Recoverable Lead #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326047 | 300872.02-502-08P Int., Flr 5, Restroom, Wall, Ceramic, Pink, Intact | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |
| 202326048 | 300872.02-502-09P Int., Flr 5, Restroom, Floor, Ceramic, Gray, Intact | < 0.004 | wt % | 4/18/2023 |
| Comments | | | | |

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**Lab Job No:** 202303488
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Unit 502, 4/3/23

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**All Quality Control data are acceptable unless otherwise noted.**
**MRL for lead air is 5ug.**
**MRL for lead wipe is 10ug.**
**MRL for lead paint or soil is 40 mg/kg for a 0.25g sample.**

General Comments
The sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures associated with the ”analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sample relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. All analysts participate in interlaboratory quality control testing to continuously document profiency. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report should not be construed as an endorsement for a product or a service by the AIHA LAP, LLC or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. TWA values have been calculated based on information supplied by the client that the laboratory has not independently verified. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
# = Analytical methods marked with an "#" are not within our AIHA LAP, LLC Scope of Accreditation.
MRL = Method Reporting Limit.

**Anne Antin**
**Quality Control Manager**

202303488
Unit 502

EnviroQuest

# Pb, Cd, Cr SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511
PAGE: 1 - 2
DATE: 4/3/23
LOCATION: CAMP COURTNEY, OKINAWA, JAPAN
PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS | ☒ 3 DAYS | ☒ BULK | ☐ WIPE | |
| ☐ 24 HRS | ☐ OTHER | ☐ SOIL | ☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-502-01P | X | | 5 | Entry | Door frame | Metal | Beige/ Brown | Int. |
| | 202326040 | | | | | | | |
| 300872.02-502-02P | X | | 5 | Entry | Door | Metal | Brown | Int. |
| | 202326041 | | | | | | | |
| 300872.02-502-03P | X | | 5 | Kitchen pantry | Door frame | Wood | Beige | Int. |
| | 202326042 | | | | | | | |
| 300872.02-502-04P | X | | 5 | Hallway Entry | Door | Wood | Beige | Int. |
| | 202326043 | | | | | | | |
| 300872.02-502-05P | X | | 5 | Bedroom 3 closet | Wall | Drywall | off-white | Int. |
| | 202326044 | | | | | | | |
| 300872.02-502-06P | X | | 5 | Kitchen | ceiling | Drywall | off-white | Int. |
| | 202326045 | | | | | | | |
| 300872.02-502-07P | X | | | Hallway | Wall | Concrete | off-white | Int. |
| | 202326046 | | | | | | | |
| 300872.02-502-08P | X | | | Restroom | Wall | ceramic | Pink | Int. |
| | 202326047 | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada | 4/12/23 | Kayla Maher<br>Kayla Maher | |
| | | | | 04-12-23A10:43 RCVD |

**Hawaii Analytical Laboratory** Samples picked up at EQI office.

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EnviroQuest 202303488

# Pb, Cd, Cr SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511 PAGE: 2-2

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS | ☐ 3 DAYS | ☐ BULK | ☐ WIPE | |
| ☐ 24 HRS | ☐ OTHER | ☐ SOIL | ☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-502-09P | X | | 5 | Restroom | Floor | Ceramic | Gray | Int |
| | 202326048 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-502-10P | | X | 5 | Balcony | Wall | concrete | Beige | Int. |
| | 202326049 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-502-11P | | X | 5 | Balcony | Wall | concrete | Brown | Int |
| | 202326050 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-502-12P | | X | 5 | Balcony | Door + door frame | Metal | Beige/Yellow | Fair |
| | 202326051 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-502-13P | | X | | Balcony | Floor | concrete | Brown | Poor |
| | 202326052 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | | | | |
| | | | | |

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# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
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**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303487
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

## Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326030** | **300872.02-C6-01P Int., Flr 6, Staircase, Door Frame, Metal, L. Brown/Yellow, Fair** | 1.7 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326031** | **300872.02-C6-02P Int., Flr 6, Staircase, Door, Metal, Tan/Yellow, Poor** | 1.3 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326032** | **300872.02-C6-03P Int., Flr 6, Staircase, Baseboard, Concrete, Dark Brown/Beige, Intact** | 0.4 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326033** | **300872.02-C6-04P Int., Flr 6, Staircase, Railing, Metal, Green/Orange, Intact** | 20 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326034** | **300872.02-C6-05P Int., Flr 6, Staircase, Wall, Concrete, Beige, Intact** | 0.0095 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326035** | **300872.02-C6-06P Int., Flr 6, Hallway, Ceiling/Soffit, Drywall, Beige, Intact** | < 0.004 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326036** | **300872.02-C6-07P Int., Flr 6, EBS C10G, Wall, Drywall, Beige, Intact** | 0.022 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326037** | **300872.02-C6-08P Int., Flr 6, Storage C09, Fire Suppression Pipe, Metal, Red, Intact** | 1.3 | wt % | 4/17/2023 |
| Comments | | | | |

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# Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326038** | **300872.02-C6-09P Int., Flr 6, Storage C09, Conduit, Metal, Beige, Intact** | < 0.004 | wt % | 4/17/2023 |
| Comments | | | | |
| **202326039** | **300872.02-C6-10P Int., Flr 6, Janitor's Room, Wall, CMU, Beige, Intact** | < 0.004 | wt % | 4/17/2023 |
| Comments | | | | |

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**Lab Job No:** 202303487
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

# Total Recoverable Cadmium #

EPA Method: 3051m / 7000Bm

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| 202326030 | 300872.02-C6-01P Int., Flr 6, Staircase, Door Frame, Metal, L. Brown/Yellow, Fair | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326031 | 300872.02-C6-02P Int., Flr 6, Staircase, Door, Metal, Tan/Yellow, Poor | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326032 | 300872.02-C6-03P Int., Flr 6, Staircase, Baseboard, Concrete, Dark Brown/Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326033 | 300872.02-C6-04P Int., Flr 6, Staircase, Railing, Metal, Green/Orange, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326034 | 300872.02-C6-05P Int., Flr 6, Staircase, Wall, Concrete, Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326035 | 300872.02-C6-06P Int., Flr 6, Hallway, Ceiling/Soffit, Drywall, Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326036 | 300872.02-C6-07P Int., Flr 6, EBS C10G, Wall, Drywall, Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326037 | 300872.02-C6-08P Int., Flr 6, Storage C09, Fire Suppression Pipe, Metal, Red, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326038 | 300872.02-C6-09P Int., Flr 6, Storage C09, Conduit, Metal, Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |
| 202326039 | 300872.02-C6-10P Int., Flr 6, Janitor's Room, Wall, CMU, Beige, Intact | < 10 | mg/kg | 4/18/2023 |
| Comments | | | | |

**Hawaii Analytical Laboratory (101812) is accredited by the AIHA LAP, LLC in the EMLAP, IHLAP, and ELLAP programs for the scope of work listed on www.aihaaccreditedlabs.org, in accordance with the recognized ISO/ IEC 17025:2017. AIHA LAP, LLC is a NLLAP recognized accrediting body. Controlled doc.: Lead Report, rev. 3 - 20181015**

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**Lab Job No:** 202303487
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

# Total Recoverable Chromium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326030** | **300872.02-C6-01P Int., Flr 6, Staircase, Door Frame, Metal, L. Brown/Yellow, Fair** | 10000 | mg/kg | 4/18/2023 |
| Comments | Due to sample heterogeneity, the sample Relative Percent Difference (RPD) was outside control limits. | | | |
| **202326031** | **300872.02-C6-02P Int., Flr 6, Staircase, Door, Metal, Tan/Yellow, Poor** | 11000 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326032** | **300872.02-C6-03P Int., Flr 6, Staircase, Baseboard, Concrete, Dark Brown/Beige, Intact** | 980 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326033** | **300872.02-C6-04P Int., Flr 6, Staircase, Railing, Metal, Green/Orange, Intact** | 3100 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326034** | **300872.02-C6-05P Int., Flr 6, Staircase, Wall, Concrete, Beige, Intact** | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326035** | **300872.02-C6-06P Int., Flr 6, Hallway, Ceiling/Soffit, Drywall, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326036** | **300872.02-C6-07P Int., Flr 6, EBS C10G, Wall, Drywall, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326037** | **300872.02-C6-08P Int., Flr 6, Storage C09, Fire Suppression Pipe, Metal, Red, Intact** | 2900 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326038** | **300872.02-C6-09P Int., Flr 6, Storage C09, Conduit, Metal, Beige, Intact** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326039** | **300872.02-C6-10P Int., Flr 6, Janitor's Room, Wall, CMU, Beige, Intact** | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |

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**Lab Job No:** 202303487
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, Common Area 6th Fl., 4/3/23

---

**All Quality Control data are acceptable unless otherwise noted.**
**MRL for lead air is 5ug.**
**MRL for lead wipe is 10ug.**
**MRL for lead paint or soil is 40 mg/kg for a 0.25g sample.**

General Comments
The sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures associated with the ”analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sample relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. All analysts participate in interlaboratory quality control testing to continuously document profiency. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report should not be construed as an endorsement for a product or a service by the AIHA LAP, LLC or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. TWA values have been calculated based on information supplied by the client that the laboratory has not independently verified. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.

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> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
# = Analytical methods marked with an "#" are not within our AIHA LAP, LLC Scope of Accreditation.
MRL = Method Reporting Limit.

**Anne Antin**
**Quality Control Manager**

202303487

EnviroQuest

Common Area 6th Fl.

# Pb, Cd, Cr SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 1 - 2

DATE: 4/3/21

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS<br>☐ 24 HRS | ☒ 3 DAYS<br>☐ OTHER | ☒ BULK<br>☐ SOIL | ☐ WIPE<br>☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C6-01P | X | | 6 | staircase | Door frame | Metal | L. Brown/ yellow | Fair |
| | 202326030 | | | | | | | |
| 300872.02-C6-02P | X | | 6 | staircase | Door | Metal | Tan/ Yellow | Poor |
| | 202326031 | | | | | | | |
| 300872.02-C6-03P | X | | 6 | Staircase | Baseboard | Concrete | Dark Brown/ Beige | Intact |
| | 202326032 | | | | | | | |
| 300872.02-C6-04P | X | | 6 | staircase | Railing | Metal | Green/ orange | Intact |
| | 202326033 | | | | | | | |
| 300872.02-C6-05P | X | | 6 | Staircase | Wall | Concrete | Beige | Intact |
| | 202326034 | | | | | | | |
| 300872.02-C6-06P | X | | 6 | Hallway | Ceiling/soffit | Drywall | Beige | Intact |
| | 202326035 | | | | | | | |
| 300872.02-C6-07P | X | | 6 | EBS C106 | Wall | Drywall | Beige | Intact |
| | 202326036 | | | | | | | |
| 300872.02-C6-08P | X | | 6 | Storage C09 | Fire suppression pipe | Metal | Red | Intact |
| | 202326037 | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Awada | 4/12/23 | Kayla Maher<br>Kayla Maher | |
| | | | 04-12-23A10:43 RCVD | |

**Hawaii Analytical Laboratory** Samples picked up at EQI office.

98-029 HEKAHA STREET, SUITE 21 AIEA, HAWAII 96701 PHONE: (808) 486-5881
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EnviroQuest

202303487

## Pb, Cd, Cr SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 2 - 2

DATE:

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS<br>☐ 24 HRS | ☐ 3 DAYS<br>☐ OTHER | ☐ BULK<br>☐ SOIL | ☐ WIPE<br>☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.<br>~~300872.~~02-C6-04P | X | | 6 | storage coq | conduit | Metal | Beige | Intact |
| | 202326038 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-C6-10P | X | | 6 | Janitors Room | Wall | CMU | Beige | Intact |
| | 202326039 | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | | | | |
| | | | | |

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# Hawaii Analytical Laboratory
# ANALYTICAL REPORT

Wednesday, April 19, 2023

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303491
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, 4/6/23

## Total Lead (paint chips)

**NIOSH Method: 7082m LEAD by FAAS**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326073** Comments | **300872.02-R-01 Ext, Roof, Fence, Metal, Beige, Poor** | 0.59 | wt % | 4/18/2023 |
| **202326074** Comments | **300872.02-R-02 Ext, Roof, Roof Felt, Concrete, Gray, Fair** | < 0.004 | wt % | 4/18/2023 |
| **202326075** Comments | **300872.02-R-03 Ext, Roof, AC Exhaust Vent, Metal, Gray/Brown** | < 0.004 | wt % | 4/18/2023 |

## Total Recoverable Cadmium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326073** Comments | **300872.02-R-01 Ext, Roof, Fence, Metal, Beige, Poor** | 82 | mg/kg | 4/18/2023 |
| **202326074** Comments | **300872.02-R-02 Ext, Roof, Roof Felt, Concrete, Gray, Fair** | < 10 | mg/kg | 4/18/2023 |
| **202326075** Comments | **300872.02-R-03 Ext, Roof, AC Exhaust Vent, Metal, Gray/Brown** | < 10 | mg/kg | 4/18/2023 |

EnviroQuest, Inc.
98-029 Hekaha Street, Suite 21
Aiea HI 96701

**Phone Number:** (808)486-5881
**Facsimile:** (808) 486-5889
**Email:** eqi@enviroquestinc.com

**Lab Job No:** 202303491
**Date Submitted:** 4/12/2023
**Project Name:** 300872.02, Repair Courtney Tower 4511, 4/6/23

# Total Recoverable Chromium #

**EPA Method: 3051m / 7000Bm**

| Sample No. | Your Sample ID / Description | Results | Units | Date Analyzed |
|---|---|---|---|---|
| **202326073** | **300872.02-R-01 Ext, Roof, Fence, Metal, Beige, Poor** | < 79 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326074** | **300872.02-R-02 Ext, Roof, Roof Felt, Concrete, Gray, Fair** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |
| **202326075** | **300872.02-R-03 Ext, Roof, AC Exhaust Vent, Metal, Gray/Brown** | < 80 | mg/kg | 4/18/2023 |
| Comments | | | | |

**All Quality Control data are acceptable unless otherwise noted.**
**MRL for lead air is 5ug.**
**MRL for lead wipe is 10ug.**
**MRL for lead paint or soil is 40 mg/kg for a 0.25g sample.**

General Comments
The sample[s] analysis subject of this analytical report were conducted in general accordance with the procedures associated with the "analytical method" referenced above. Modifications to this methodology may have been made based upon the analyst's professional judgment and / or sample matrix effects encountered. The analysis of sample relates only to the sample analyzed, and may or may not be representative of the original source of the material submitted for our analysis. All analysts participate in interlaboratory quality control testing to continuously document profiency. This report is not to be duplicated except in full without the expressed written permission of Hawaii Analytical Laboratory. This report should not be construed as an endorsement for a product or a service by the AIHA LAP, LLC or any affiliated organizations. Sample and associated sampling / collection data is reported as provided by client. TWA values have been calculated based on information supplied by the client that the laboratory has not independently verified. Results have not been corrected for blank determinations unless noted in remarks. Unless otherwise indicated the sample condition at the time of receipt was acceptable.

Results and Symbols Definitions
> This testing result is greater than the numerical value listed.
< This testing result is less than the numerical value listed.
# = Analytical methods marked with an "#" are not within our AIHA LAP, LLC Scope of Accreditation.
MRL = Method Reporting Limit.

**Anne Antin**
**Quality Control Manager**

EnviroQuest

202303491

# Cd, Cr Pb SAMPLE FORM

PROJECT NAME: REPAIR COURTNEY TOWER 4511

PAGE: 1

DATE: 4/6/23

LOCATION: CAMP COURTNEY, OKINAWA, JAPAN

PROJECT NO.: 300872.02

| TURNAROUND TIME | | MEDIA | | COMMENTS |
|---|---|---|---|---|
| ☐ <12 HRS | ☒ 3 DAYS | ☒ BULK | ☐ WIPE | |
| ☐ 24 HRS | ☐ OTHER | ☐ SOIL | ☐ OTHER | |

| SAMPLE NO | INT | EXT | FLR | ROOM | COMPONENT | SUBSTRATE | COLOR | CONDITION |
|---|---|---|---|---|---|---|---|---|
| 300872.02-R-01P | | X | | Roof | Fence | Metal | Beige | poor |
| 202326073 | | | | | | | | |
| 300872.02-R-02P | | X | | Roof | Roof felt | concrete | gray | Fair |
| 202326074 | | | | | | | | |
| 300872.02-R-03P | | X | | Roof | AC exhaust vent | Metal | gray/brown | Intact |
| 202326075 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| SAMPLED BY | RELINQUISHED BY | DATE & TIME | RECEIVED BY | DATE & TIME |
|---|---|---|---|---|
| Landon Awada<br>Jesus Sacramento | L. Arada | 4/12/23 | Kayla Maher<br>Kayla Maher | 04-12-23A10:45 RCVD |

**Hawaii Analytical Laboratory**

Samples picked up at EQI office.

98-029 HEKAHA STREET, SUITE 21 AIEA, HAWAII 96701 PHONE: (808) 486-5881
6-15-17 KAMITSURUMA, MINAMI-KU, SAGAMIHARA-SHI, KANAGAWA-KEN 252-0302 PHONE: (042) 851-5675

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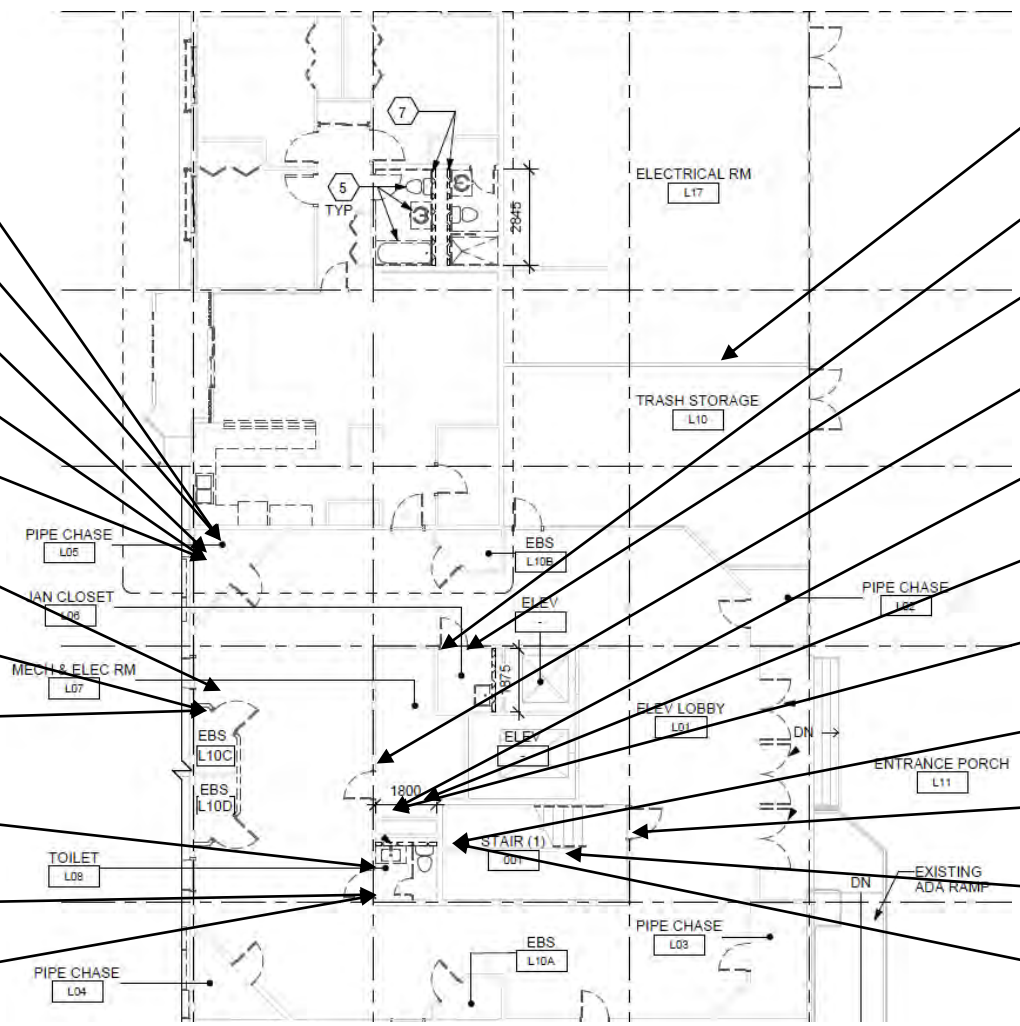
# APPENDIX C

SAMPLE LOCATION DRAWINGS

300872.02-C1-14A
300872.02-C1-15A
300872.02-C1-09A
300872.02-C1-12A
300872.02-C1-13A
300872.02-C1-04A
300872.02-C1-07A
300872.02-C1-08A
300872.02-C1-01A
300872.02- C1-05A
300872.02-C1-06A




300872.02-C1-23A
300872.02-C1-02A
300872.02-C1-16A
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300872.02-C1-18A
300872.02-C1-10A
300872.02-C1-19A
300872.02-C1-18A2
300872.02-C1-17A
300872.02-C1-03A
300872.02- C1-19A2

# 1st FLOOR COMMON AREA

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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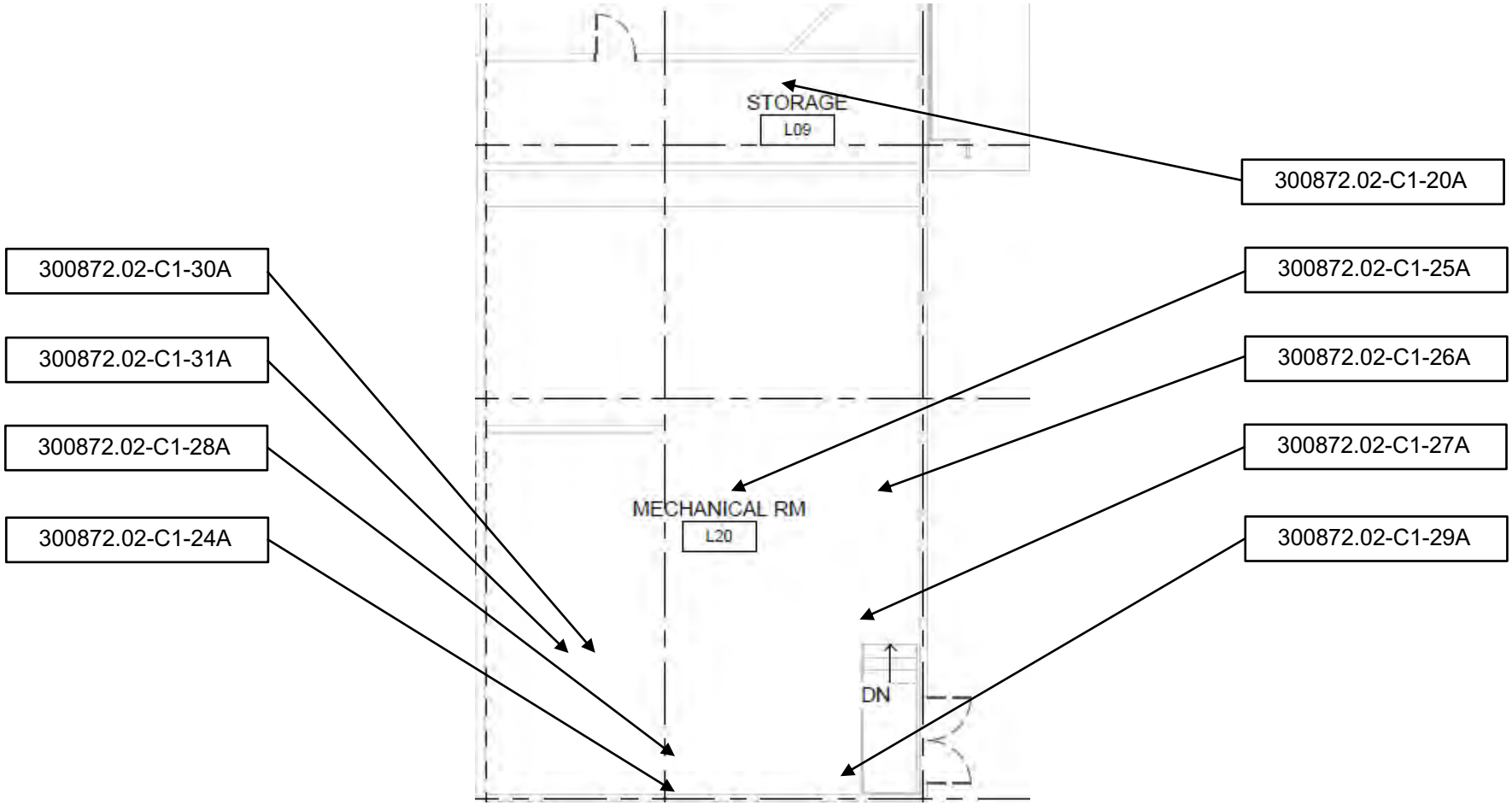
ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

Page 1 of 20




# 1st FLOOR COMMON AREA

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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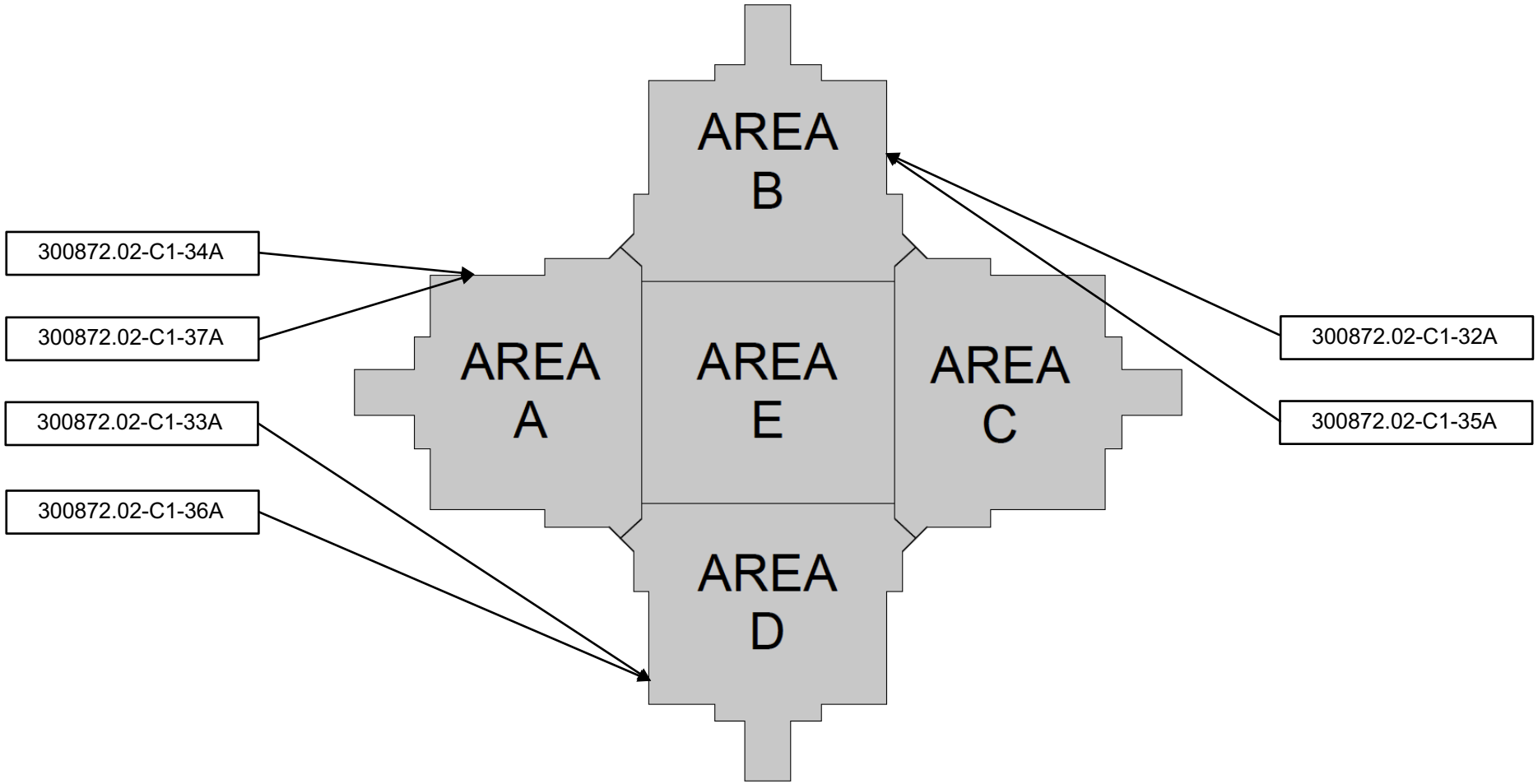
ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

Page 2 of 20




1st FLOOR COMMON AREA

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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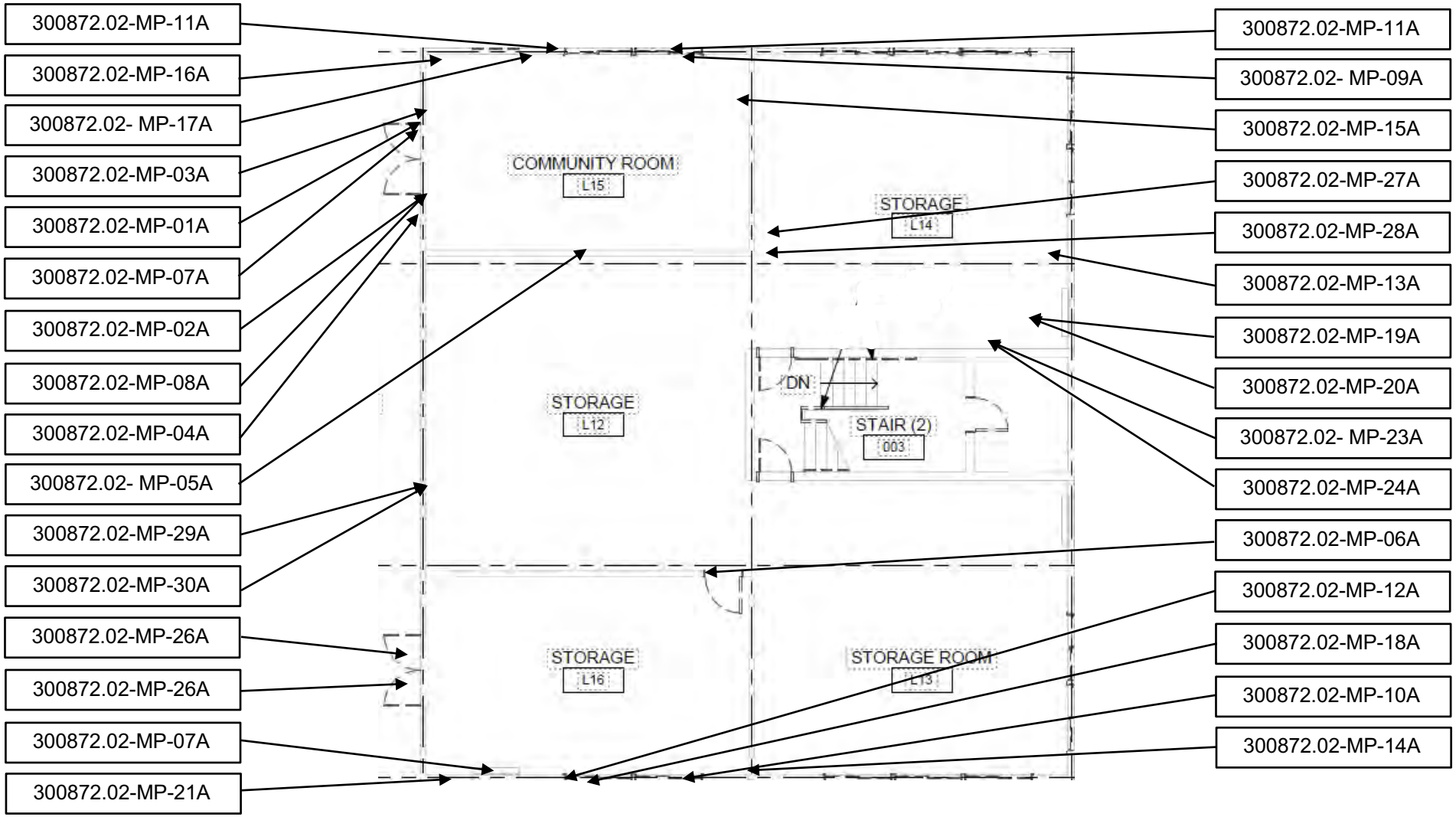
ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

Page 3 of 20




# 1st FLOOR MULTI PURPOSE ROOM

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
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Camp Courtney, Okinawa, Japan

April 2023

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300872.02-104-01A
300872.02-104-02A
300872.02-104-12A
300872.02-104-04A
300872.02-104-15A
300872.02-104-10A
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300872.02-104-09A
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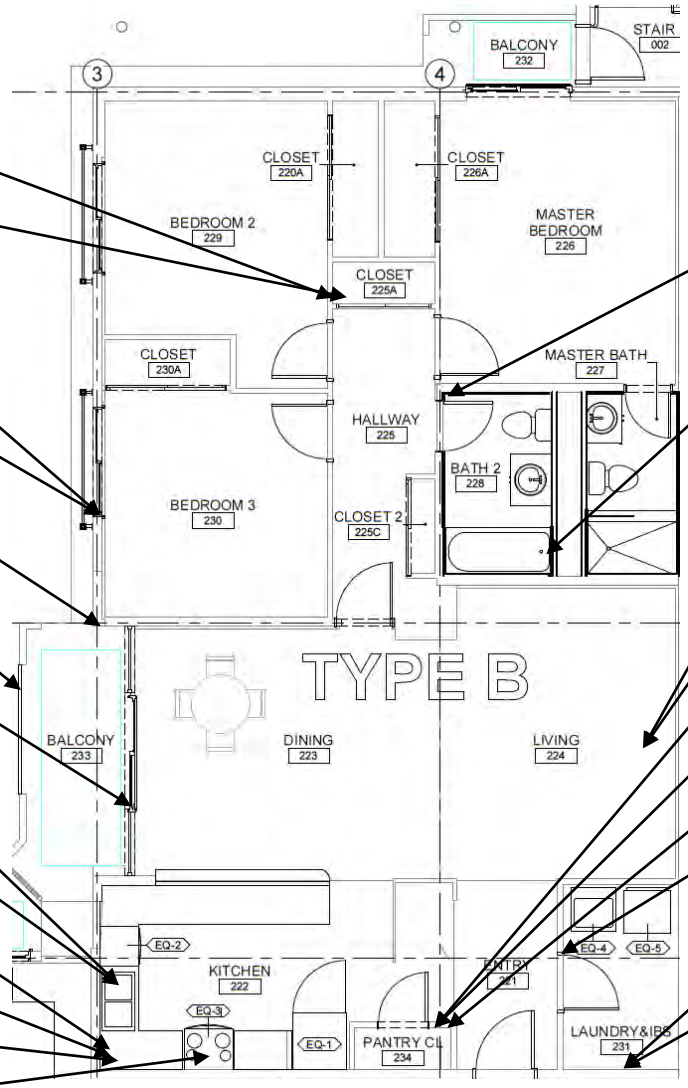


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300872.02-104-07A
300872.02-104-03A
300872.02-104-21A
300872.02-104-22A

UNIT 104

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
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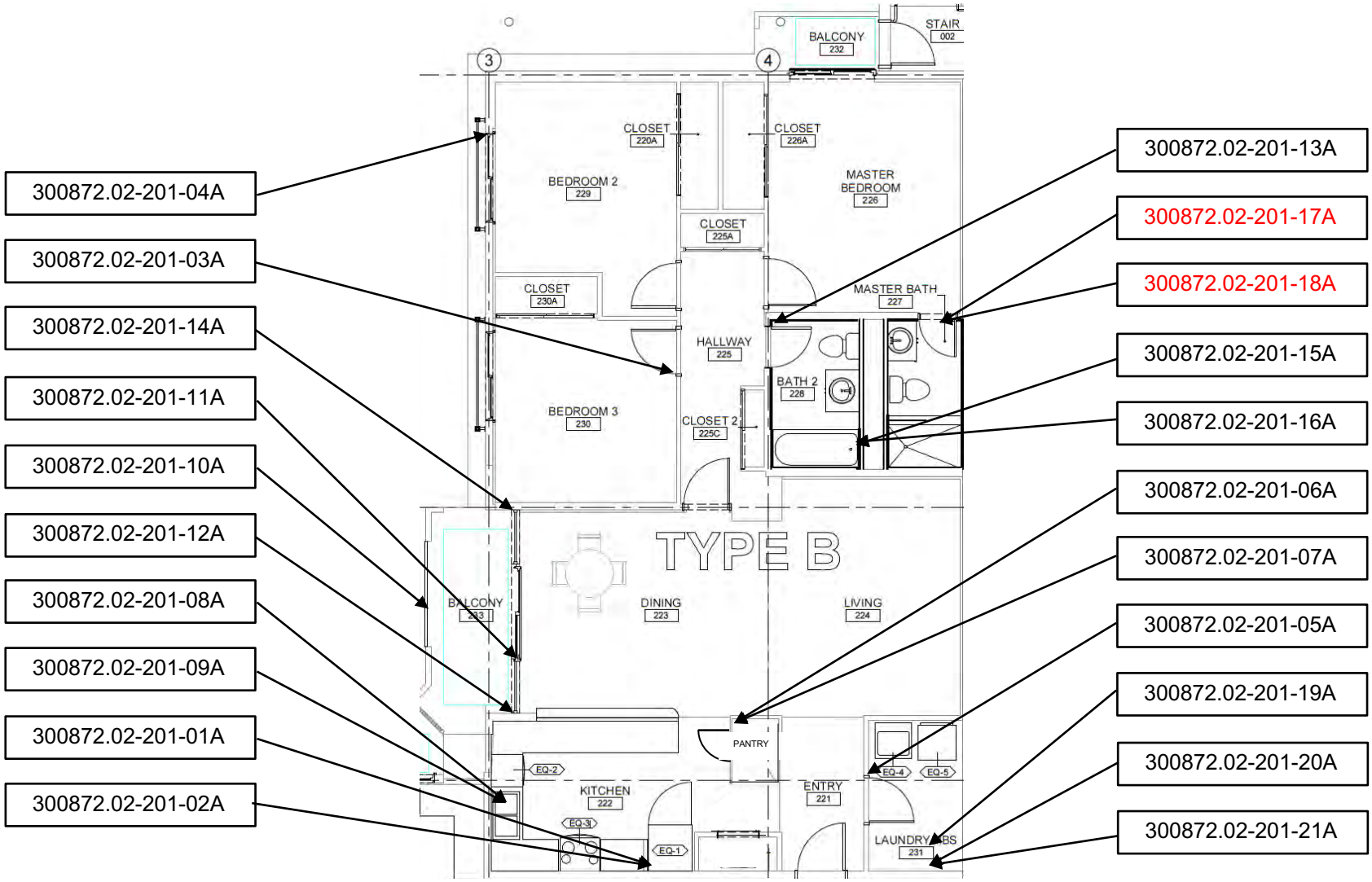


UNIT 201

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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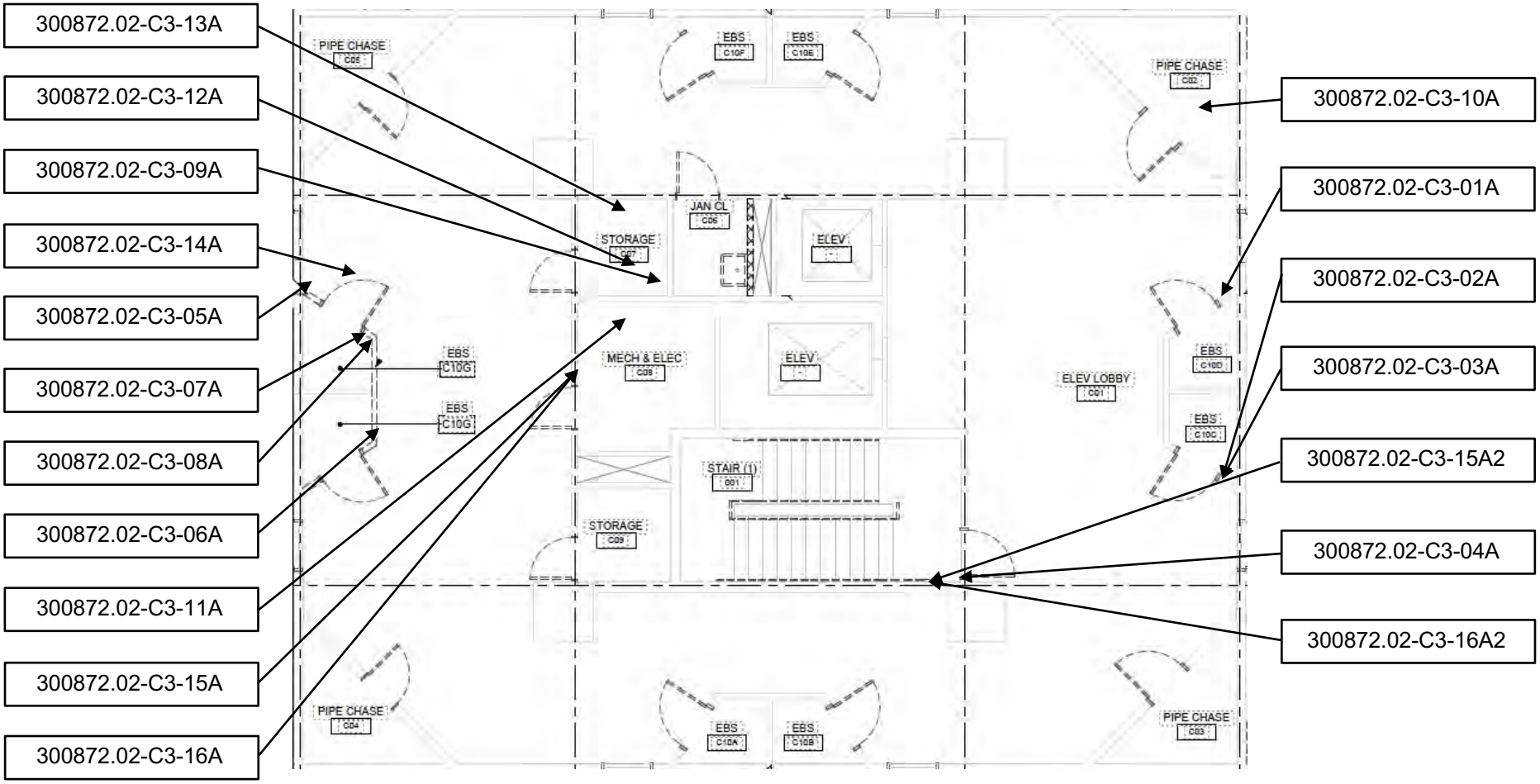
Page 6 of 20




# 3rd Floor Common Area

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
Building 4511
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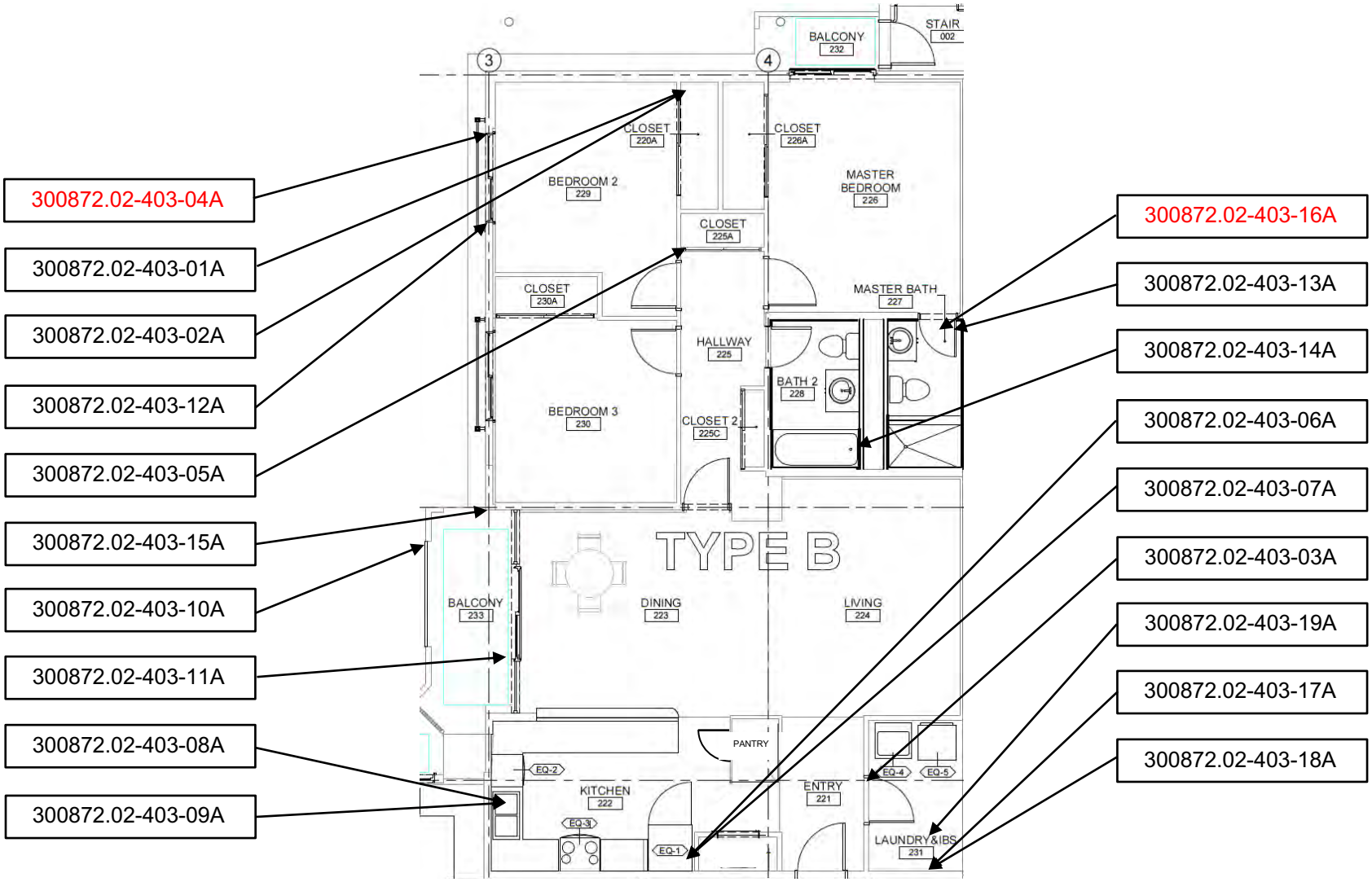
April 2023




UNIT 403

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

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300872.02-502-32A
300872.02-502-24A
300872.02-502-13A
300872.02-502-11A
300872.02-502-02A
300872.02-502-04A
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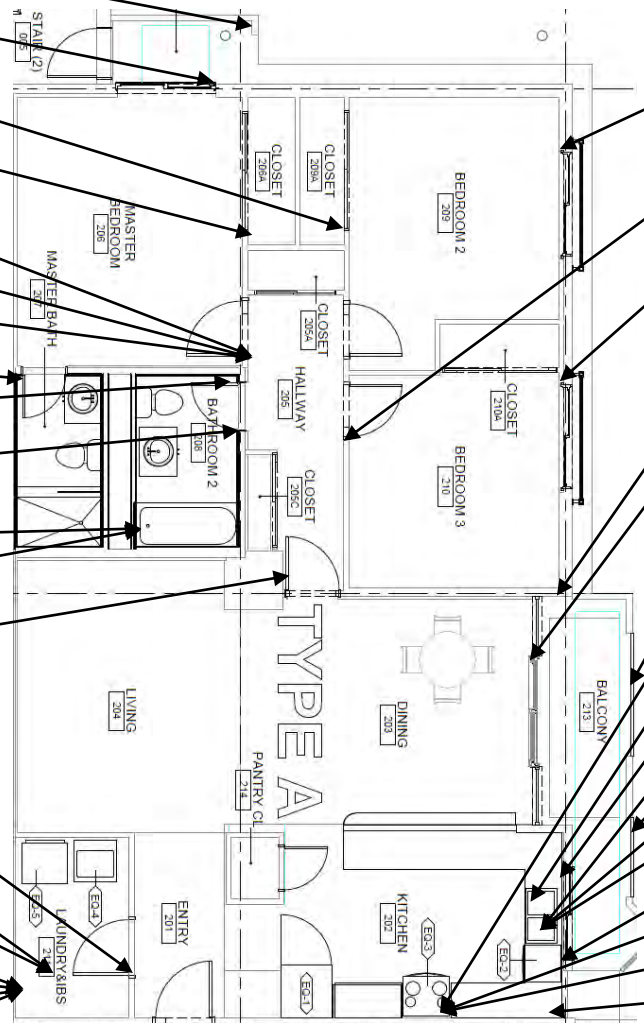


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300872.02-502-18A
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300872.02-502-19A
300872.02-502-22A
300872.02-502-20A
300872.02-502-17A
300872.02-502-25A
300872.02-502-03A
300872.02-502-05A
300872.02-502-16A

UNIT 502

BLACK = NEGATIVE
RED = POSITIVE

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ASBESTOS SAMPLE LOCATION
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300872.02-C6-11A
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300872.02-C6-10A
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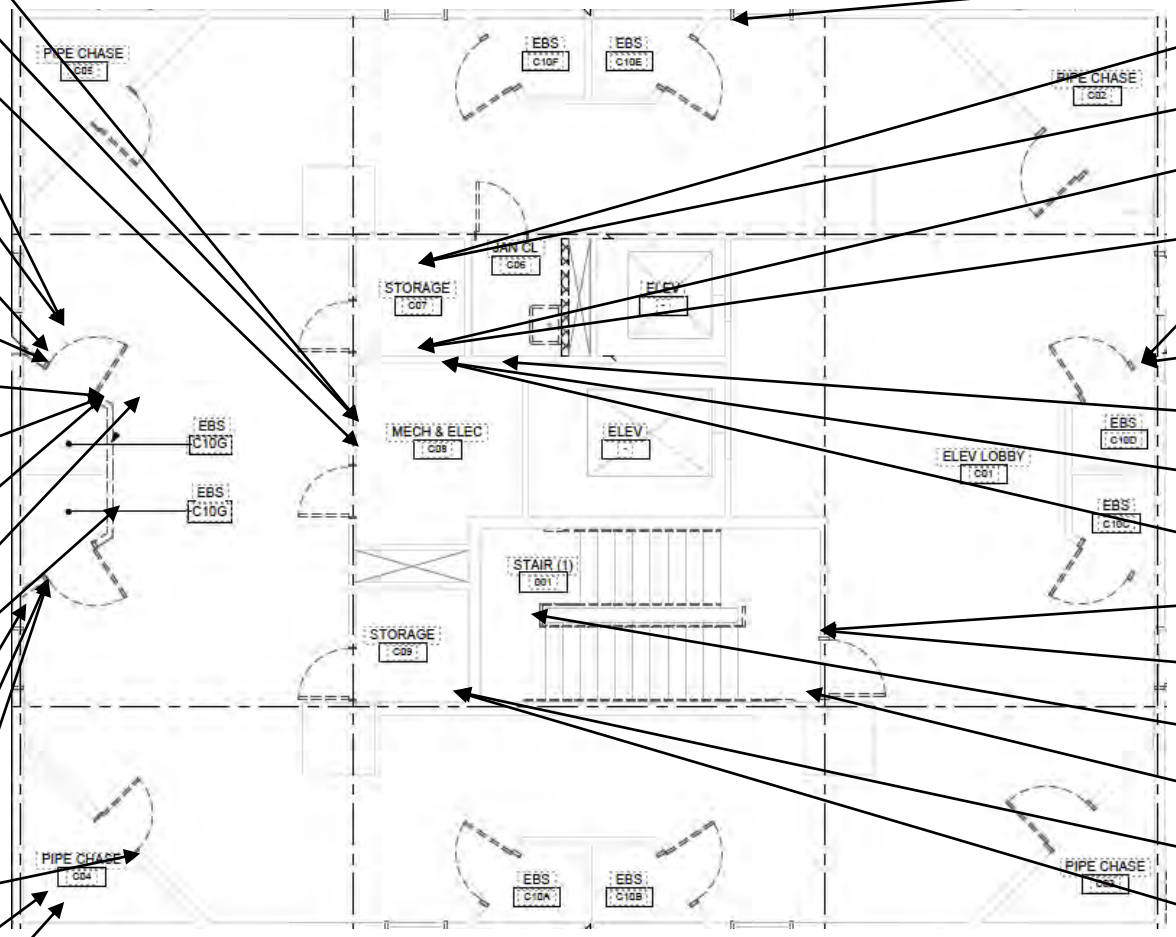


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300872.02-C6-30A2
300872.02-C6-32A2
300872.02-C6-08A
300872.02-C6-07A
300872.02-C6-17A
300872.02-C6-18A

# 6th Floor Common Area

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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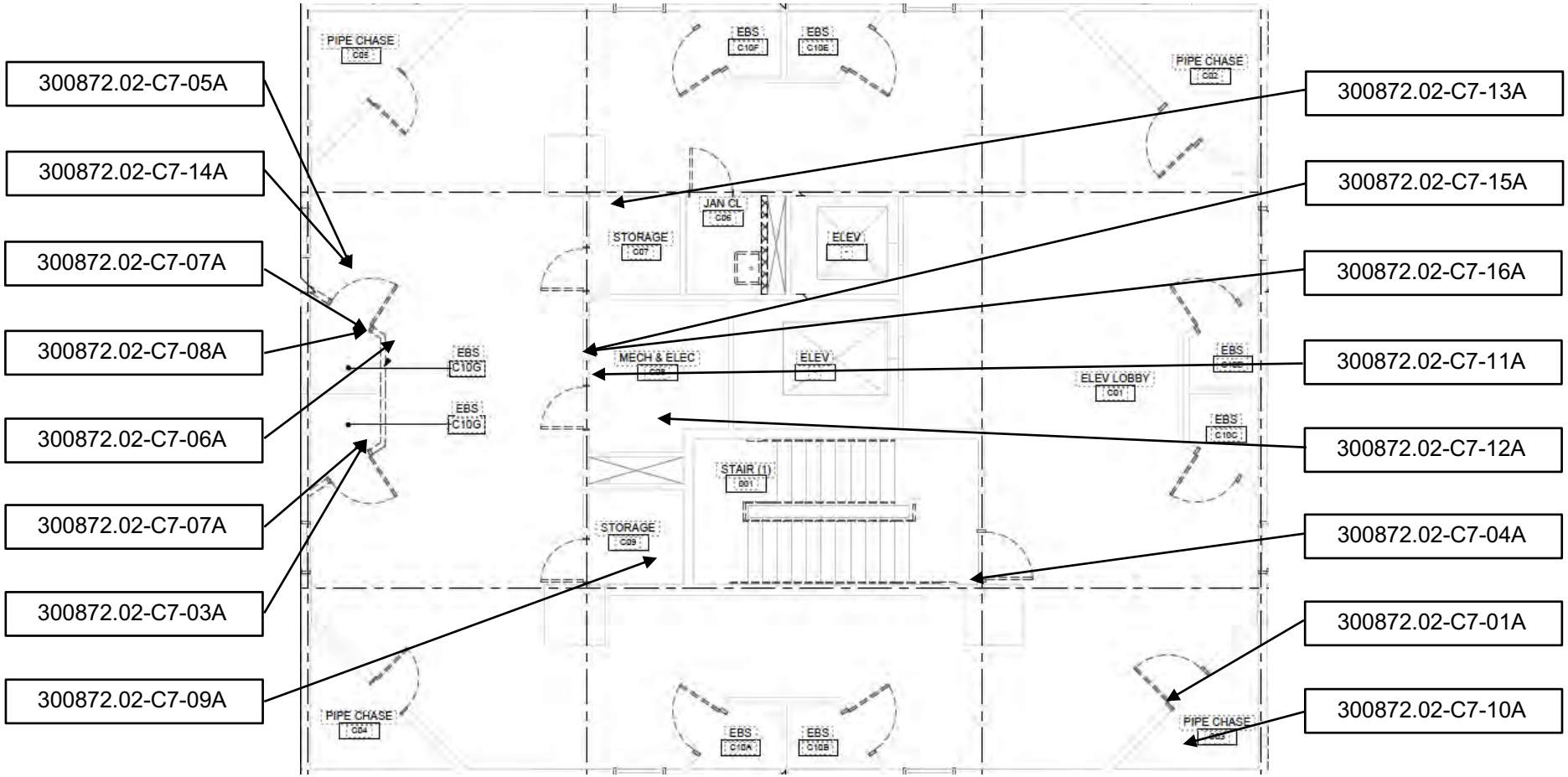
ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023




# 7th Floor Common Area

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

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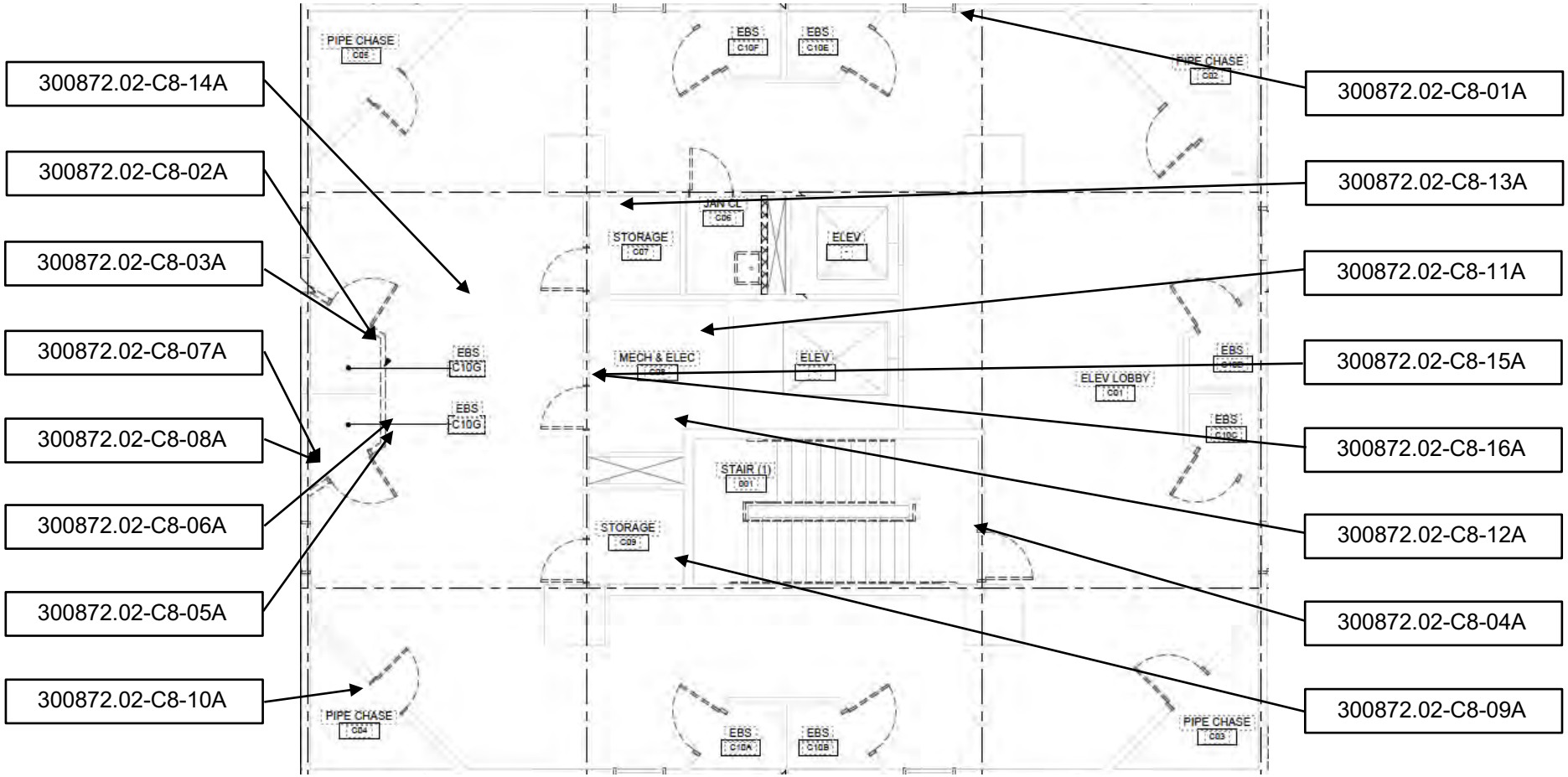


# 8th Floor Common Area

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

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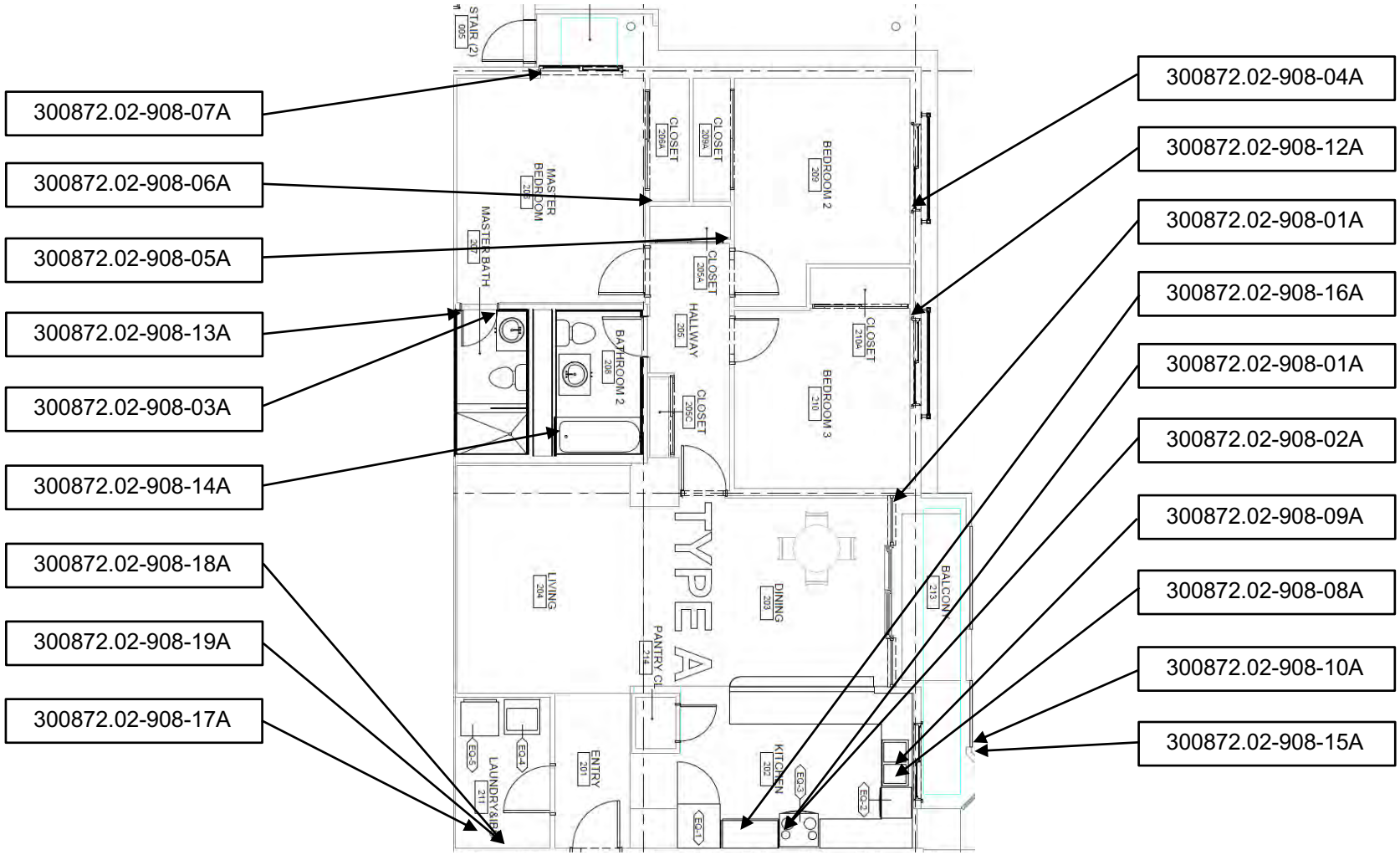


UNIT 908

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
Building 4511
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April 2023

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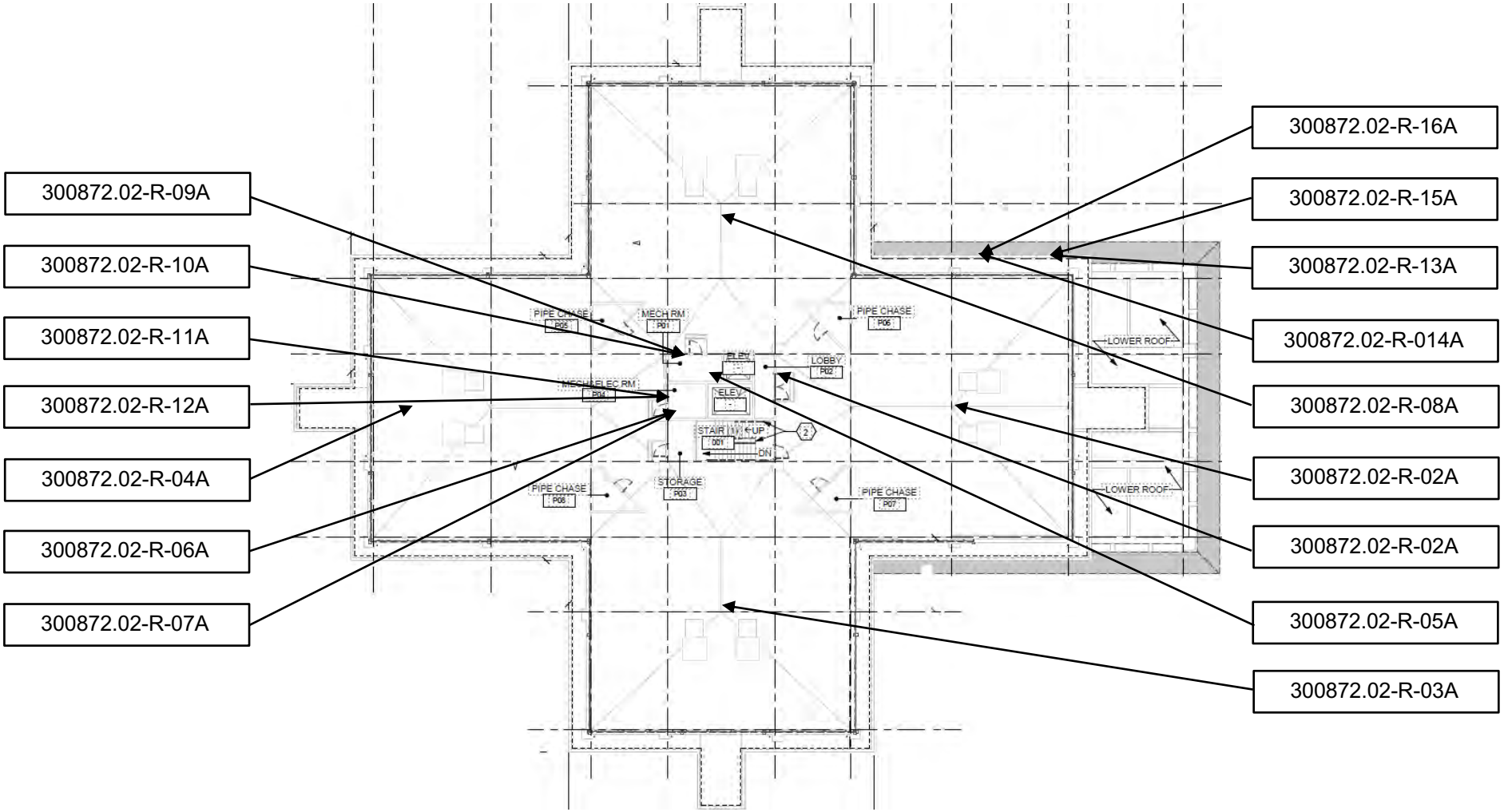


UPPER AND LOWER ROOFS

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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ASBESTOS SAMPLE LOCATION
Building 4511
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April 2023

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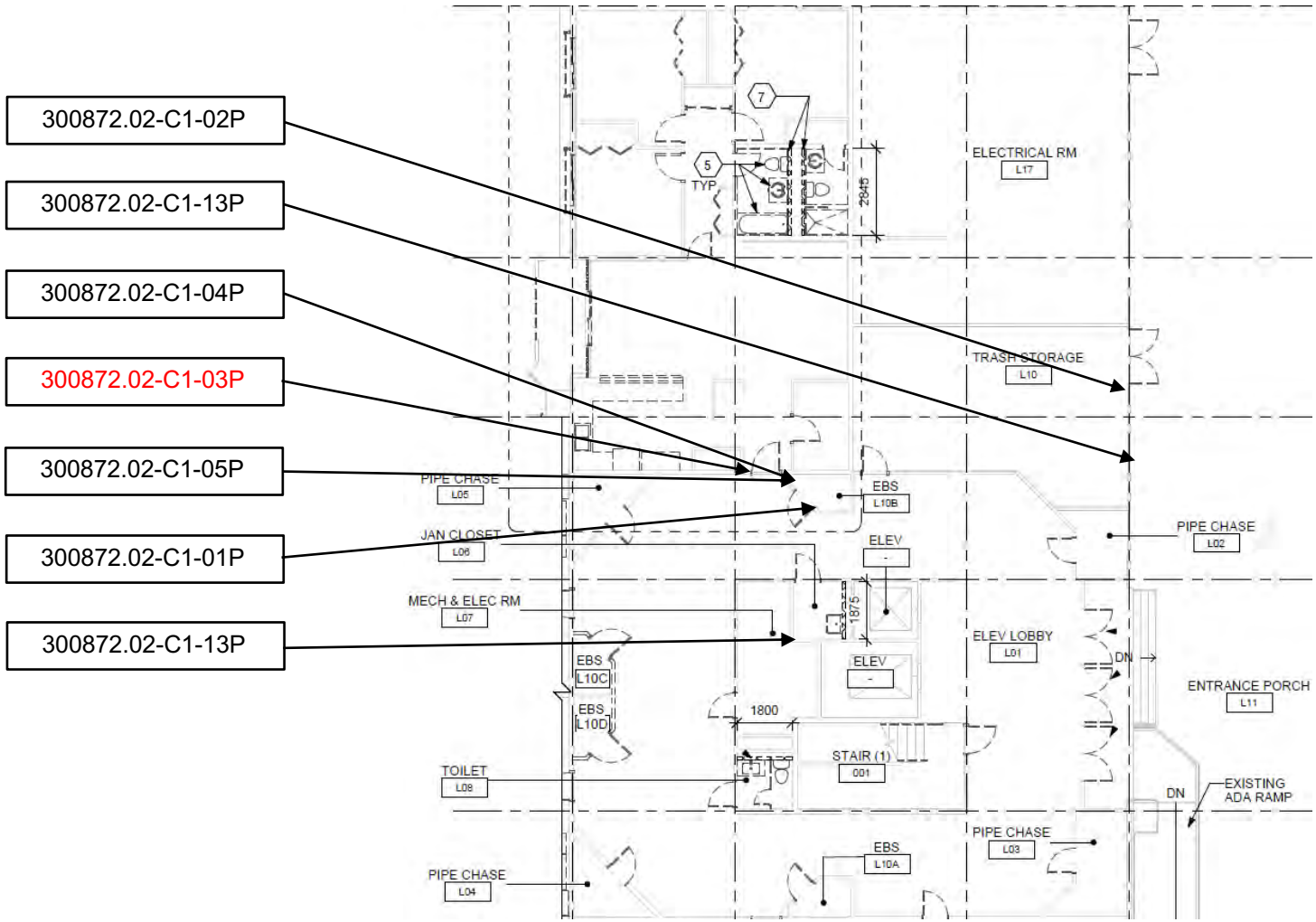


# 1st FLOOR COMMON AREA

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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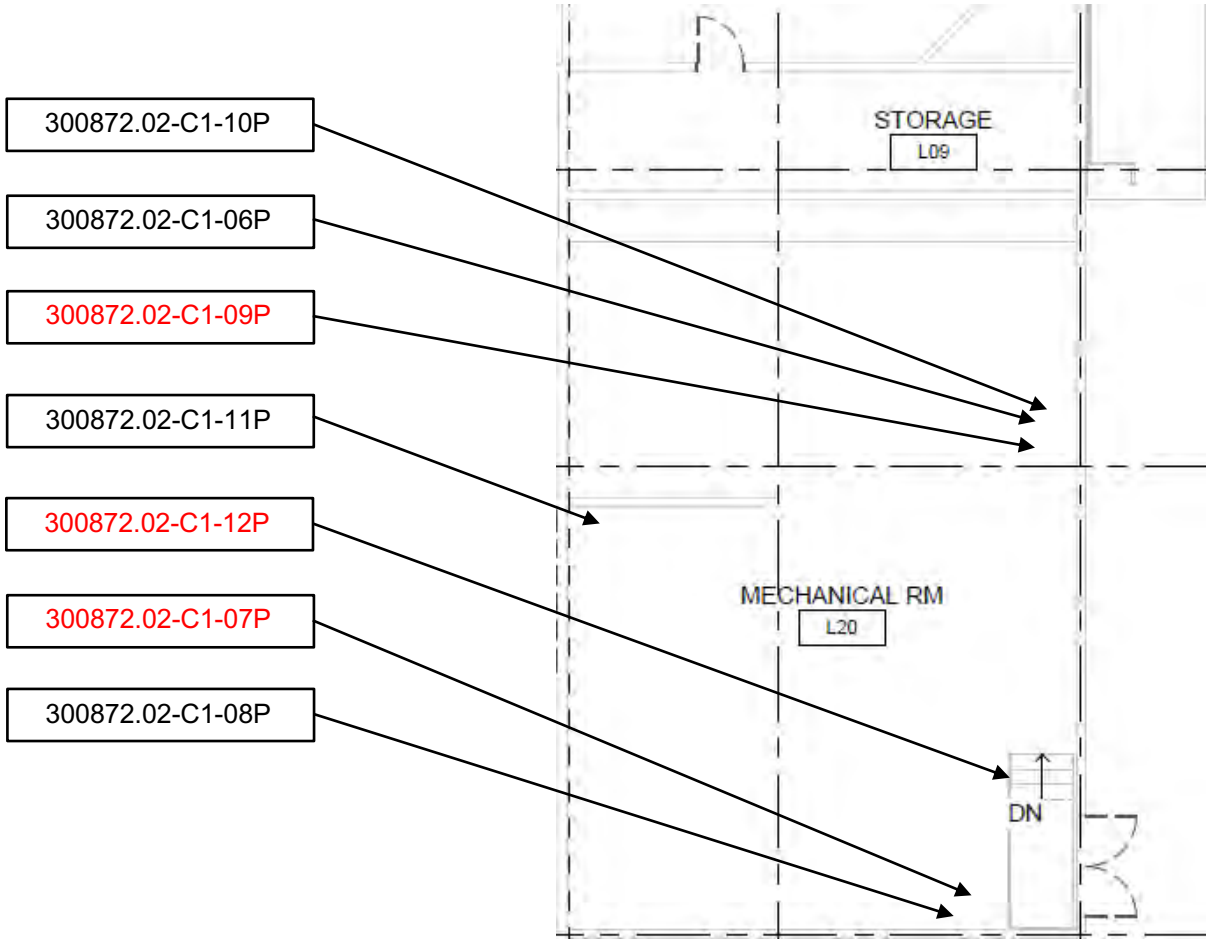
LEAD, CADMIUM AND CHROMIUM SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023




# 1st FLOOR COMMON AREA

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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LEAD, CADMIUM AND CHROMIUM SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

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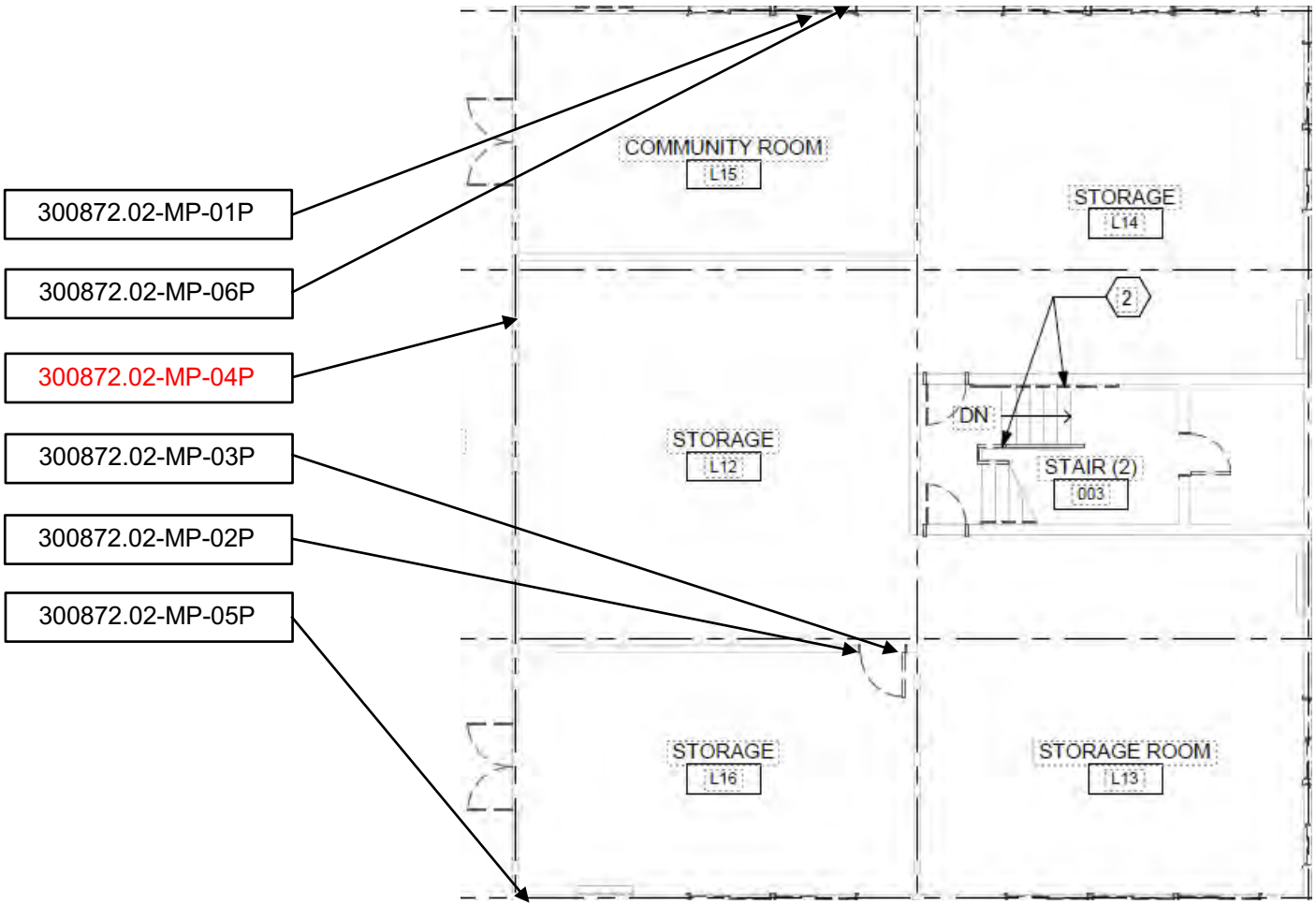


# 1st FLOOR MULTI PURPOSE ROOM

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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LEAD, CADMIUM AND CHROMIUM SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

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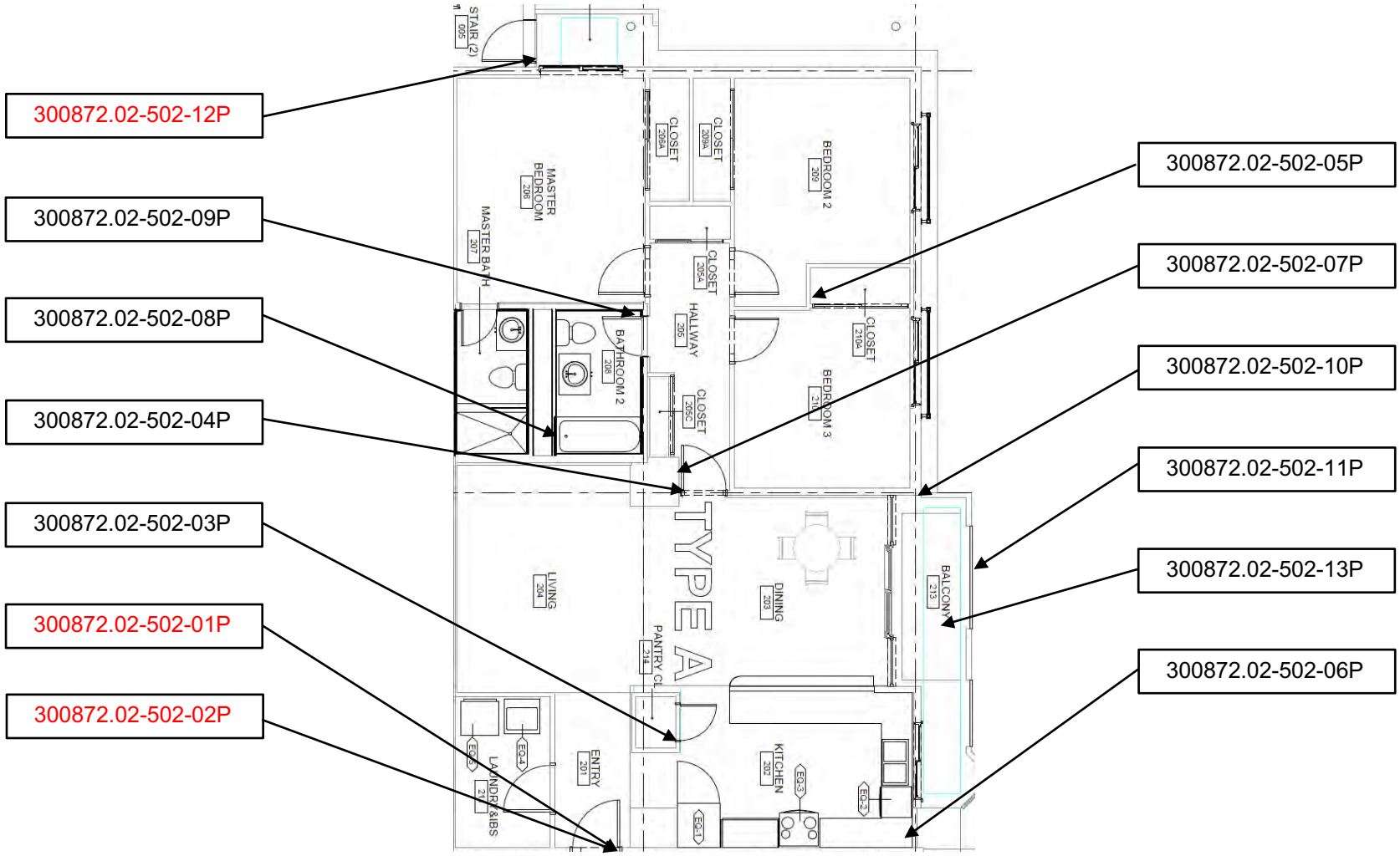


UNIT 502

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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LEAD, CADMIUM AND CHROMIUM SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

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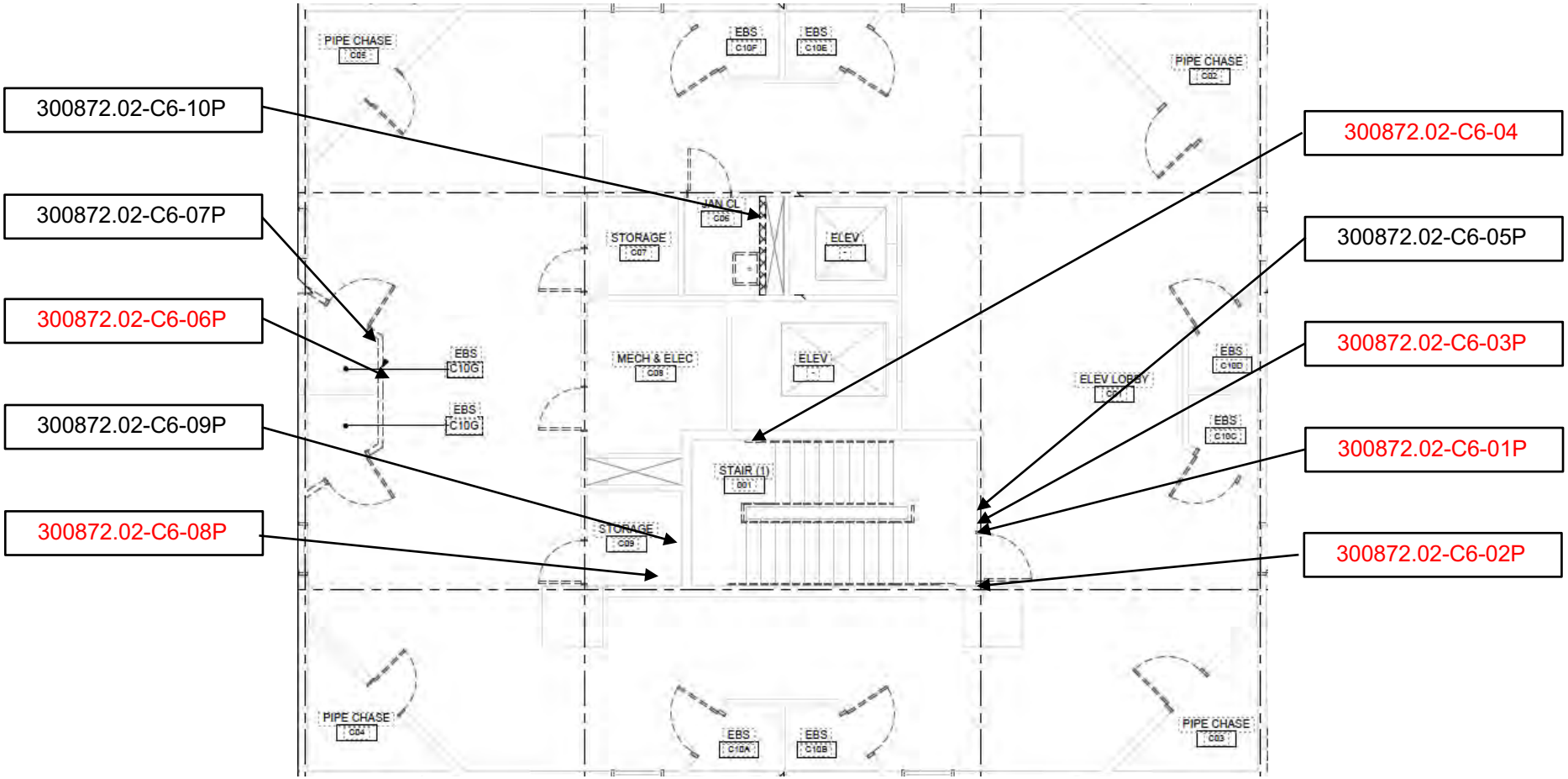


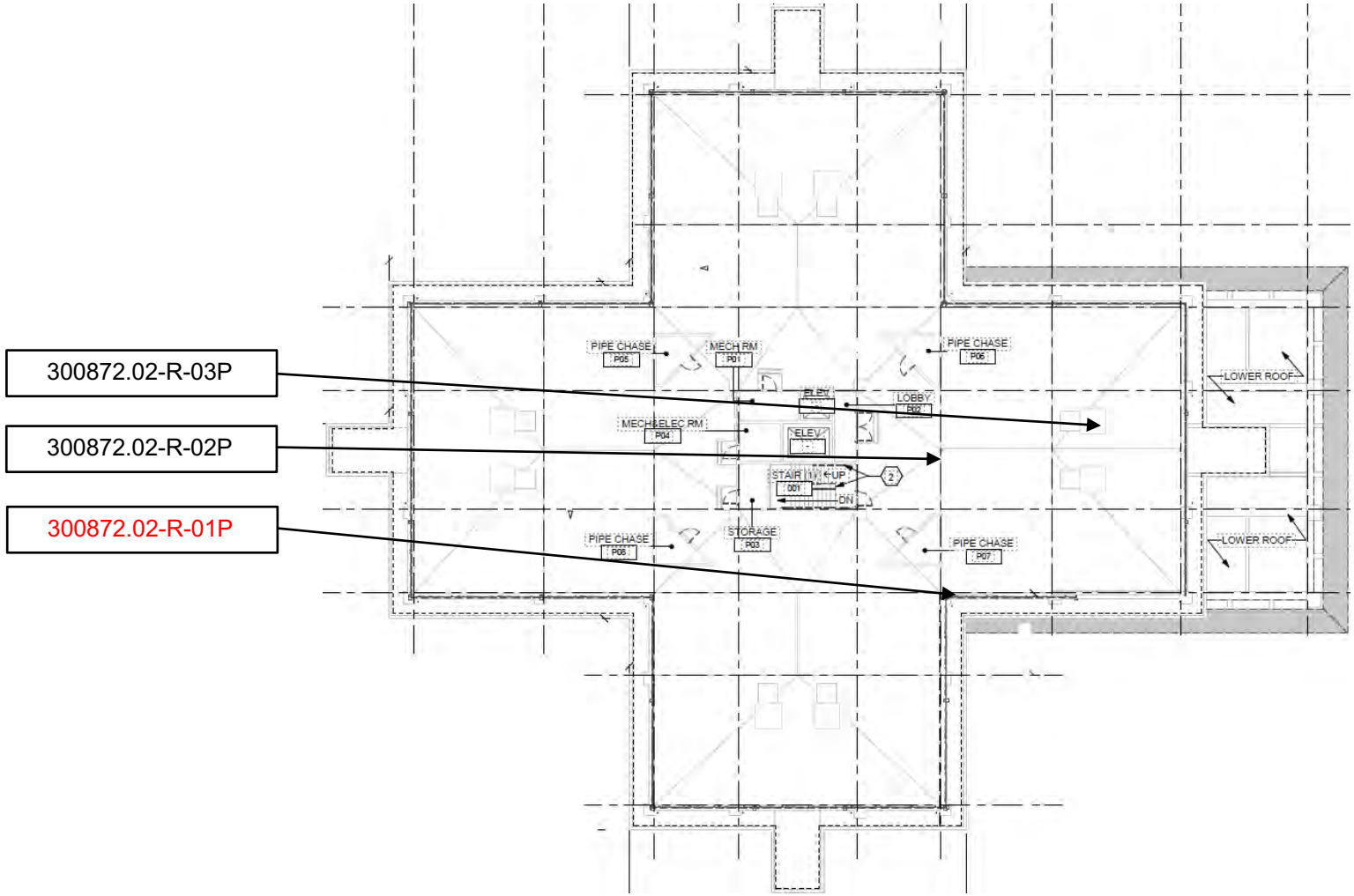

# 6th Floor Common Area

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

EnviroQuest

LEAD, CADMIUM AND CHROMIUM SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023




# UPPER AND LOWER ROOFS

| | |
|---|---|
| BLACK | = NEGATIVE |
| RED | = POSITIVE |

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LEAD SAMPLE LOCATION
Building 4511
Camp Courtney, Okinawa, Japan

April 2023

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# APPENDIX D

## PERSONNEL CERTIFICATES

**State of Hawai'i**
**Lead Based Paint Activities Certification**

**Expiration Dates:**

| | |
|---|---|
| Inspector- | 01/10/2026 |
| Supervisor- | 07/27/2024 |
| Risk Assessor- | 07/27/2024 |
| Project Designer- | 04/05/2024 |
| Worker- | n/a |

**Sacramento**
**Jesus**
Certification # PB-0070

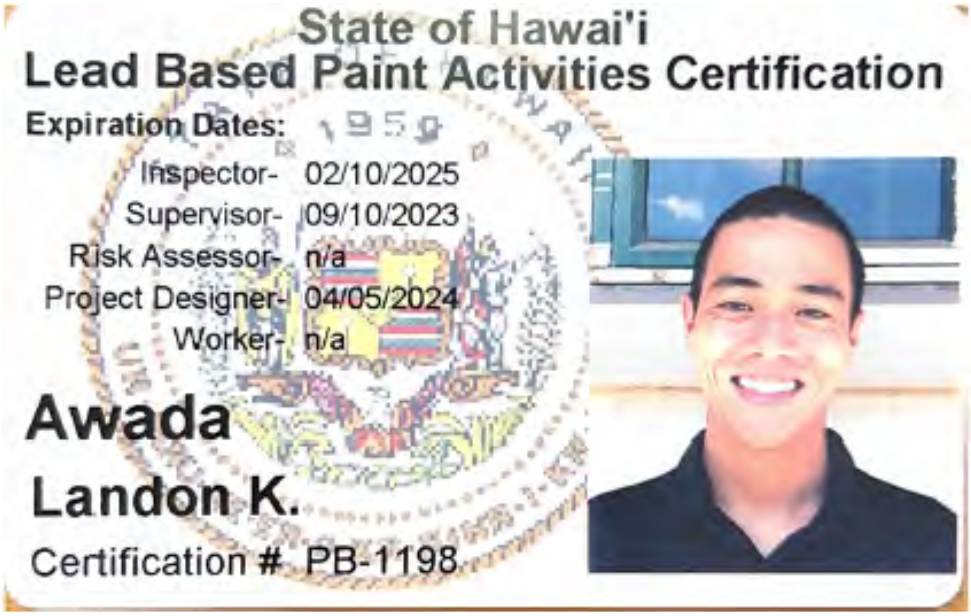
**State of Hawai'i**
**Asbestos Certification**

**Training Course Exp. Dates**

| | | | |
|---|---|---|---|
| **W** | n/a | **MP** | 08/05/23 |
| **CS** | 12/20/23 | **PD** | 12/19/23 |
| **INS** | 06/10/23 | **PM** | n/a |

W= Worker
CS= Cont./Sup.
INS= Inspector
PD= Project Designer
MP= Mgmt. Planner
PM= Project Monitor

**Sacramento**
Jesus V.
EnviroQuest, Inc.
**HIASB-0173**
**State Exp. Date** 08/23/2023


State of Hawai'i
Lead Based Paint Activities Certification
Expiration Dates:
Inspector- 02/10/2025
Supervisor- 09/10/2023
Risk Assessor- n/a
Project Designer- 04/05/2024
Worker- n/a
Awada
Landon K.
Certification # PB-1198

State of Hawai'i
Asbestos Certification
Training Course Exp. Dates
W n/a
CS 03/03/24
INS 06/10/23
MP 08/05/23
PD 05/27/23
PM n/a
W= Worker
CS= Cont./Sup.
INS= Inspector
PD= Project Designer
MP= Mgmt. Planner
PM= Project Monitor
Awada
Landon K.
EnviroQuest, Inc.
HIASB-5045
State Exp. Date 04/08/2024

EnviroQuest

# APPENDIX E

## LABORATORY CERTIFICATIONS

# AIHA Laboratory Accreditation Programs, LLC

*acknowledges that*

## Hawaii Analytical Laboratory, LLC

### 3615 Harding Avenue #308, Honolulu, HI 96816

**Laboratory ID: LAP-101812**

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA LAP), LLC accreditation to the ISO/IEC 17025:2017 international standard, General Requirements for the Competence of Testing and Calibration Laboratories in the following:

### LABORATORY ACCREDITATION PROGRAMS

| | | |
|---|---|---|
| ☑ | **INDUSTRIAL HYGIENE** | Accreditation Expires: January 01, 2025 |
| ☑ | **ENVIRONMENTAL LEAD** | Accreditation Expires: January 01, 2025 |
| ☑ | **ENVIRONMENTAL MICROBIOLOGY** | Accreditation Expires: January 01, 2025 |
| ☐ | **FOOD** | Accreditation Expires: |
| ☐ | **UNIQUE SCOPES** | Accreditation Expires: |

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached Scope of Accreditation. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2017 and AIHA LAP, LLC requirements. This certificate is not valid without the attached Scope of Accreditation. Please review the AIHA LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

*Cheryl O Morton*
*Managing Director, AIHA Laboratory Accreditation Programs, LLC*

Revision20: 06/07/2022

Date Issued: 01/01/2023

**United States Department of Commerce**
**National Institute of Standards and Technology**

# Certificate of Accreditation to ISO/IEC 17025:2017

**NVLAP LAB CODE: 200655-0**

## Hawaii Analytical Laboratory, LLC

Honolulu, HI

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

## Asbestos Fiber Analysis

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2023-04-01 through 2024-03-31

*Effective Dates*

*For the National Voluntary Laboratory Accreditation Program*

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# SECTION 01 74 19

# CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| JEGS | (April 2024) Japan Environmental Governing Standards |

### 1.2 GOVERNMENT POLICY

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy, practice efficient waste management when sizing, cutting, and installing products and materials, and use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse. Divert a minimum of 60 percent by weight of total project solid waste from the landfill.Comply with TPC requirements as specified in Section 01 33 29 SUSTAINABILITY REPORTING.

### 1.3 MANAGEMENT

Develop and implement a waste management program. Take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. The Environmental Manager, as specified in Section 01 57 19.01 TEMPORARY ENVIRONMENTAL CONTROLS, is responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the project. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste, consider the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. Implement any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recyclable materials not claimed by the Government will accrue to the Contractor. Appropriately permit firms and facilities used for recycling, reuse, and disposal for the intended use to the extent required by federal, state, and local regulations. Also, provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Management Plan; G

SD-11 Closeout Submittals

Records

## 1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Waste Management Plan and to develop a mutual understanding relative to the details of waste management. The requirements for this meeting may be fulfilled during the coordination and mutual understanding meeting outlined in Section 01 45 00.00 10 QUALITY CONTROL. At a minimum, discuss environmental and waste management goals and issues at the following additional meetings:

a. Pre-bid meeting.

b. Preconstruction meeting.

c. Regular QC meetings.

d. Work safety meetings.

## 1.6 WASTE MANAGEMENT PLAN

Submit a Waste Management Plan within 15 days after Notice to Proceed. The plan demonstrates how to meet the the project waste diversion goal. Also, include the following in the plan:

a. Name of individuals on the Contractor's staff responsible for waste prevention and management.

b. Actions that will be taken to reduce solid waste generation, including coordination with Subcontractors to ensure awareness and participation.

c. Description of the regular meetings to be held to address waste management.

d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.

e. Characterization, including estimated types and quantities, of the waste to be generated.

f. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.

g. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity. Include the name, location, and phone number for each reuse facility to be used, and provide a copy of the permit or license for each facility.

h. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Identify the recycling facilities by name, location, and phone number, including a copy of the permit or license for each facility.

i. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by the Contracting Officer.

j. Description of the means by which any waste materials identified in item (h) above will be protected from contamination.

k. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).

l. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan shall not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Distribute copies of the Waste Management Plan to each Subcontractor, the Quality Control Manager, and the Contracting Officer.

## 1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Quantities may be measured by weight or by volume, but must be consistent throughout. List each type of waste separately noting the disposal or diversion date. Identify the landfill, recycling center, waste processor, or other organization used to process or receive the solid waste. Provide explanations for any waste not recycled or reused. With each application for payment, submit updated documentation for solid waste disposal and diversion, and submit manifests, weight tickets, receipts, and invoices specifically identifying the project and waste material. Make the records available to the Contracting Officer during construction, and deliver to the Contracting Officer upon completion of the construction a copy of the records.

## 1.8 REPORTS

Provide quarterly reports and a final report to Contracting Officer. Include project name, information for waste generated this quarter, and cumulative totals for the project in quarterly and final reports. Also

include in each report, supporting documentation to include manifests, weight tickets, receipts, and invoices specifically identifying the project and waste material. Include timber harvest and demolition information, if any. See Section 01 57 19.01 TEMPORARY ENVIRONMENTAL CONTROLS for Nonhazardous Solid Waste Diversion Report requirements.

## 1.9 COLLECTION

Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management and clearly and appropriately identify them. Provide materials for barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable. Locate out of the way of construction traffic. Provide adequate space for pick-up and delivery and convenience to Subcontractors. Recycling and waste bin areas are to be kept neat and clean, and handle recyclable materials to prevent contamination of materials from incompatible products and materials. Clean contaminated materials prior to placing in collection containers. Use cleaning materials that are nonhazardous and biodegradable. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19.01 TEMPORARY ENVIRONMENTAL CONTROLS. Separate materials by one of the following methods:

### 1.9.1 Source Separated Method

Separate waste products and materials that are recyclable from trash and sorted as described below into appropriately marked separate containers. Transport materials to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the following category types as appropriate to the project waste and to the available recycling and reuse programs in the project area:

a. Land clearing debris.

b. Asphalt.

c. Concrete and masonry.

d. Metal (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, lead brass, bronze).

   (1) Ferrous.

   (2) Non-ferrous.

e. Wood (nails and staples allowed).

f. Debris.

g. Glass (colored glass allowed).

h. Paper.

(1) Bond.

(2) Newsprint.

(3) Cardboard and paper packaging materials.

i. Plastic.

(1) Type 1 - Polyethylene Terephthalate (PET, PETE).

(2) Type 2 - High Density Polyethylene (HDPE).

(3) Type 3 - Vinyl (Polyvinyl Chloride or PVC).

(4) Type 4 - Low Density Polyethylene (LDPE).

(5) Type 5 - Polypropylene (PP).

(6) Type 6 - Polystyrene (PS).

(7) Type 7 - Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

j. Gypsum.

k. Non-hazardous paint and paint cans.

l. Carpet.

m. Ceiling tiles.

n. Insulation.

o. Beverage containers.

1.9.2 Co-Mingled Method

Place waste products and recyclable materials into a single container and then transport to a recycling facility where the recyclable materials are sorted and processed.

1.9.3 Other Methods

Other proposed methods may be used when approved by the Contracting Officer.

1.10 DISPOSAL

Control accumulation of waste materials and trash. Where materials are to be turned over to the Contractor for disposal, every effort shall be made to obtain credit from the disposal to reduce the cost of the Contract. Recycle or dispose of collected materials off of Government property at intervals approved by the Contracting Officer and in compliance with waste management procedures of JEGS and local laws and regulations. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

1. Reuse. Give first consideration to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Consider sale or donation of waste suitable for reuse.

2. Recycle. Recycle waste materials not suitable for reuse, but having value as being recyclable. Recycle all fluorescent lamps, HID lamps, and mercury-containing thermostats removed from the site. Arrange for timely pickups from the site or deliveries to recycling facilities in order to prevent contamination of recyclable materials.

3. Compost. Consider composting on-site if a reasonable amount of compostable material will be available. Compostable materials include plant material, sawdust, and certain food scraps.

4. Waste. Dispose of materials with no practical use or economic benefit to waste-to-energy plants where available. As the last choice, dispose of materials at a landfill or incinerator.

5. Return. Set aside and protect misdelivered and substandard products and materials and return to supplier for credit.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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**05/19**

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CLOSEOUT SUBMITTALS
**05/19**

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E1971 | (2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings |

GREEN SEAL (GS)

| | |
|---|---|
| GS-37 | (2017) Cleaning Products for Industrial and Institutional Use |

SPATIAL DATA STANDARDS FOR FACILITIES, INFRASTRUCTURE, AND ENVIRONMENT (SDSFIE)

| | |
|---|---|
| SDSFIE 3.1.0.1 | (2015) Air Force Data Model |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| ERDC/ITL TR-12-1 | (2015) A/E/C Graphics Standard, Release 2.0 |
| ERDC/ITL TR-12-6 | (2015) A/E/C CAD Standard - Release 6.0 |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| UFC 1-300-08 | (2009, with Change 2, 2011) Criteria for Transfer and Acceptance of DoD Real Property |

## 1.2 DEFINITIONS

### 1.2.1 As-Built Drawings

As-built drawings are the marked-up drawings, maintained by the Contractor on-site, that depict actual conditions and deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to submitted Requests for Information (RFI's); direction from the Contracting Officer; design that is the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site and/or red-lined PDF files. These files serve as the basis for the creation of the record drawings.

### 1.2.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the as-built drawings.

### 1.2.3 USACE CAD/BIM Technology Center

The USACE CAD/BIM Technology Center hosts all standard content for USACE. This content can be accessed through the CAD/BIM Technology Center website, https://cadbimcenter.erdc.dren.mil/.

## 1.3 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

### 1.3.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan; G

Warranty Tags

Final Cleaning

Spare Parts Data

SD-08 Manufacturer's Instructions

Posted Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

As-Built Drawings; G

Record Drawings; G

As-Built Record of Equipment and Materials; G

Final Approved Shop Drawings; G

Construction Contract Specifications; G

Interim DD FORM 1354; G

Checklist for DD FORM 1354; G

## 1.5 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

a. Indicate manufacturer's name, part number, nomenclature, and stock level required for maintenance and repair. List those items that may be standard to the normal maintenance of the system.

## 1.6 QUALITY CONTROL

Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols.

## 1.7 WARRANTY MANAGEMENT

### 1.7.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan narrative must contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar

with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Submit warranty information, made available during the construction phase, to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period must begin on the date of project acceptance and continue for the full product warranty period. Conduct a joint 4 month and 9 month warranty inspection, measured from time of acceptance; with the Contractor, Contracting Officer and the Customer Representative. The warranty management plan must include, but is not limited to, the following:

a. Roles and responsibilities of personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. For each warranty, the name, address, telephone number, and email of each of the guarantor's representatives nearest to the project location.

c. A list and status of delivery of Certificates of Warranty for extended warranty items, including roofs, HVAC balancing, pumps, motors, transformers, and for commissioned systems, such as fire protection and alarm systems, sprinkler systems, and lightning protection systems.

d. As-Built Record of Equipment and Materials list for each warranted equipment, item, feature of construction or system indicating:

(1) Name of item.
(2) Model and serial numbers.
(3) Location where installed.
(4) Name and phone numbers of manufacturers or suppliers.
(5) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
(6) Cross-reference to warranty certificates as applicable.
(7) Starting point and duration of warranty period.
(8) Summary of maintenance procedures required to continue the warranty in force.
(9) Cross-reference to specific pertinent Operation and Maintenance manuals.
(10) Organization, names and phone numbers of persons to call for warranty service.
(11) Typical response time and repair time expected for various warranted equipment.

e. The plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

f. Procedure and status of tagging of equipment covered by extended warranties.

g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty or safety reasons.

1.7.2 Performance Bond

The Performance Bond must remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.7.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. At this meeting, establish and review communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact must be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.7.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and back charge the construction warranty payment item established.

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate

situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

Code 1-Life Safety Systems
(1) Fire suppression systems.
(2) Fire alarm system(s) in place in the building.

Code 1-Air Conditioning Systems
(1) Recreational support.
(2) Air conditioning leak in part of building, if causing damage.
(3) Air conditioning system not cooling properly.

Code 1-Doors
(1) Overhead doors not operational, causing a security, fire, or safety problem.
(2) Interior, exterior personnel doors or hardware, not functioning properly, causing a security, fire, or safety problem.

Code 3-Doors
(1) Overhead doors not operational.
(2) Interior/exterior personnel doors or hardware not functioning properly.

Code 1-Electrical
(1) Power failure (entire area or any building operational after 1600 hours).
(2) Security lights
(3) Smoke detectors

Code 2-Electrical
(1) Power failure (no power to a room or part of building).
(2) Receptacle and lights (in a room or part of building).

Code 3-Electrical
Street lights.

Code 1-Gas
(1) Leaks and breaks.
(2) No gas to family housing unit or cantonment area.

Code 1-Heat
(1) Area power failure affecting heat.
(2) Heater in unit not working.

Code 2-Kitchen Equipment
(1) Dishwasher not operating properly.
(2) All other equipment hampering preparation of a meal.

Code 1-Plumbing
(1) Hot water heater failure.
(2) Leaking water supply pipes.

Code 2-Plumbing
(1) Flush valves not operating properly.

(2) Fixture drain, supply line to commode, or any water pipe leaking.
(3) Commode leaking at base.

Code 3 -Plumbing
Leaky faucets.

Code 3-Interior
(1) Floors damaged.
(2) Paint chipping or peeling.
(3) Casework.

Code 1-Roof Leaks
Temporary repairs will be made where major damage to property is occurring.

Code 2-Roof Leaks
Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2-Water (Exterior)
No water to facility.

Code 2-Water (Hot)
No hot water in portion of building listed.

Code 3-All other work not listed above.

### 1.7.5 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

| | |
|---|---|
| Type of product/material | |
| Model number | |
| Serial number | |
| Contract number | |
| Warranty period from/to | |
| Inspector's signature | |
| Construction Contractor | |
| Address | |

| | |
|---|---|
| Telephone number | |
| Warranty contact | |
| Address | |
| Telephone number | |
| Warranty response time priority code | |
| WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD. | |

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

Prepare the CAD drawing files in AutoCAD Release 2013 format and Bentley Microstation V8i format compatible with a Windows 7 or higher operating system.

2.1.1 Additional Drawings

If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings.

2.1.1.1 Sheet Numbers and File Names

If a sheet needs to be added between two sequential sheets, append a Supplemental Drawing Designator in accordance with ERDC/ITL TR-12-6 Adding a drawing sheet, and ERDC/ITL TR-12-1.

2.2 PDF AS-BUILT FILES

Provide electronic PDF "plots" of all contract drawings sheets associated with the as-built drawing submittal. Compile and organize the PDF set to match the contract drawings.

2.3 REDLINES AND MARKUPS

Provide PDFs of the current working redlines and/or markups complying with the as-builts drawing and markup requirements contained in this specification.

2.4 AS-BUILT RE-SUBMISSION REQUIREMENTS

If elements of an as-built submittal or advanced modeling package are rejected, provide the following for each re-submission, in addition to any information required in Section 01 33 00 SUBMITTAL PROCEDURES:

a. Re-submit all components required under paragraph As-Builts or

Advanced Modeling Package, including a new Advanced Modeling Submittal Checklist and updated content in response to Government comments.

b. Provide a copy of all Government review comments.

c. Provide a disposition/response to each Government review comment for a back-check of the re-submission deliverable.

# PART 3 EXECUTION

## 3.1 AS-BUILT DRAWINGS

Provide and maintain two black line print copies of the PDF contract drawings for As-Built Drawings. Maintain the as-builts throughout construction as red-lined hard copies on site and/or red-lined PDF files. Submit As-Built Drawings 30 days prior to Beneficial Occupance Date (BOD).

### 3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate as follows:

a. Use base colors of red, green, and blue. Color code for changes as follows:

(1) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

(2) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

(3) Additions (Green) - Added items, lettering in notes and leaders.

b. Provide a legend if colors other than the "base" colors of red, green, and blue are used.

c. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.

d. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.

e. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.

f. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

g. For deletions, cross out all features, data and captions that relate to that revision.

h. For changes on small-scale drawings and in restricted areas, provide

large-scale inserts, with leaders to the applicable location.

i. Indicate one of the following when attaching a print or sketch to a markup print:

1) Add an entire drawing to contract drawings

2) Change the contract drawing to show

3) Provided for reference only to further detail the initial design.

j. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 As-Built Drawings Content

Revise As-Built Drawings in accordance with ERDC/ITL TR-12-1 and ERDC/ITL TR-12-6. Keep these working as-built markup drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract drawings which are made during construction or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Submit the working as-built markup drawings for approval prior to submission of each monthly pay estimate. For failure to maintain the working and final record drawings as specified herein, the Contracting Officer will withhold 10 percent of the monthly progress payment until approval of updated drawings. Show on the as-built drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. The location and dimensions of any changes within the building structure.

c. Layout and schematic drawings of electrical circuits and piping.

d. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

e. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.

f. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

g. Changes or Revisions which result from the final inspection.

h. Where contract drawings or specifications present options, show only

the option selected for construction on the working as-built markup drawings.

i. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

j. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

k. Changes in location of equipment and architectural features.

j. Modifications (include within change order price the cost to change working as-built markup drawings to reflect modifications).

l. Actual location of anchors, construction and control joints, etc., in concrete.

m. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

n. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

### 3.1.3 GIS Data

Provide GIS data with as-builts. GIS data shall be in a format accepted by ESRI software. Data shall comply with SDSFIE 3.1.0.1. The Air Force adaptation data dictionary can be obtained from the Kadena GeoBase Office (718ces.geobase@us.af.mil or DSN 634-9322). All GIS data shall be delivered with the following requirements:

a. Projection: UTM Zone 52N

b. Datum: WGS 1984

c. Geoid: EGM 96

d. Units: Meters

## 3.2 RECORD DRAWING FILES

If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CAD files. Provide all program files and hardware necessary to prepare final PDF record drawings. The Contracting Officer will review final PDF record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

### 3.2.1 Rename the CAD Drawing files

Rename the CAD Drawing files using the Contract number as the Project Code field, (e.g., W912HV-15-C-0001-A-101.DWG) as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. Make all changes on the layer/level as the original item.

a. For AutoCAD files (DWG), enter all as-built delta changes and notations on the AS-BUILT layer.

c. When final revisions have been completed, show the wording "RECORD DRAWING AS-BUILTS" followed by the name of the Contractor in letters at least 5 mm high on the cover sheet drawing. Date RECORD DRAWING AS-BUILTS" drawing revisions in the revision block.

d. Within 20 days after Government approval of all of the working record drawings for a phase of work, prepare the final CAD record drawings for that phase of work and submit PDF drawing files and two sets of prints for review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days revise the CAD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 20 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic CAD files, and one set of the approved working record PDF files on an optical disc with two sets of prints. The CAD files must be complete in all details and identical in form and function to the CAD drawing files supplied by the Government. Prepare AutoCAD files for transmittal using e-Transmit. Make any transactions or adjustments necessary to accomplish this. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CAD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final record PDF drawing files, CAD files and marked prints as specified will be cause for withholding any payment due under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made.

## 3.3 RECORD DRAWINGS

Prepare final record drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan (such as Foundations, Utilities, or Structural Steel as appropriate for the project). Transfer the changes from the approved working as-built markup drawings to the original electronic CAD drawing files. Modify the as-built CAD drawing files to correctly show the features of the project as-built by bringing the working CAD drawing set into agreement with approved working as-built markup drawings, and adding such additional drawings as may be necessary. Refer to ERDC/ITL TR-12-1. Jointly review the working as-built markup drawings with printouts from working as-built CAD drawing PDF files for accuracy and completeness. Monthly review of working as-built CAD drawing PDF file printouts must cover all sheets revised since the previous review. These PDF drawing files are part of the permanent records of this project. Any drawings damaged or lost must be satisfactorily replaced at no expense to the Government.

Drawing revisions (include within change order price the cost to change working and final record drawings to reflect revisions) and compliance with the following procedures.

a. Follow directions in the revision for posting descriptive changes.

b. The revision delta size must be 8 mm unless the area where the delta is to be placed is crowded. Use a smaller size delta for

crowded areas.

c. Place a revision delta at the location of each deletion.

d. For new details or sections which are added to a drawing, place a revision delta by the detail or section title.

e. For minor changes, place a revision delta by the area changed on the drawing (each location).

f. For major changes to a drawing, place a revision delta by the title of the affected plan, section, or detail at each location.

g. For changes to schedules or drawings, place a revision delta either by the schedule heading or by the change in the schedule.

### 3.3.1 Final Record Drawing Package

Submit the final record PDF and CAD drawings package for the entire project within 20 days of substantial completion of all phases of work. Submit one set of A1 size PDF and CAD files on optical disc, read-only memory (ROM), two sets of A1 size prints and one set of the approved working record drawings. The package must be complete in all details and identical in form and function to the contract drawing files supplied by the Government.

## 3.4 FINAL APPROVED SHOP DRAWINGS

Submit final approved project shop drawings 30 days after transfer of the completed facility.

## 3.5 CONSTRUCTION CONTRACT SPECIFICATIONS

Submit final PDF file record construction contract specifications, including revisions thereto, 30 days after transfer of the completed facility.

## 3.6 AS-BUILT RECORD OF EQUIPMENT AND MATERIALS

Furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Submit Two sets of final record of equipment and materials 10 days after final inspection. Key the designations to the related area depicted on the contract drawings. List the following data:

| RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA | | | | |
|---|---|---|---|---|
| Description | Specification Section | Manufacturer and Catalog, Model, and Serial Number | Composition and Size | Where Used |
| | | | | |

| RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA | | | | |
|---|---|---|---|---|
| Description | Specification Section | Manufacturer and Catalog, Model, and Serial Number | Composition and Size | Where Used |
| | | | | |

## 3.7 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE MANUALS DATA. Provide one electronic copy of the Operation and Maintenance Manual files and three hard copies of the Operation and Maintenance Manuals. Submit to the Contracting Officer for approval within 30 calendar days of the Beneficial Occupancy Date (BOD). Update and resubmit files for final approval at BOD.

## 3.8 CLEANUP

Provide final cleaning in accordance with ASTM E1971 and submit two copies of the listing of completed final clean-up items. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean filters of operating equipment and comply with the Indoor Air Quality (IAQ) Management Plan as required. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with Section 01 57 19.01 TEMPORARY ENVIRONMENTAL CONTROLS, and 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

## 3.9 REAL PROPERTY RECORD

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete and submit an accounting of all installed property with Interim DD FORM 1354. Contact the Contracting Officer for any project specific information necessary to complete the DD FORM 1354. Refer to UFC 1-300-08 for instruction on completing the DD FORM 1354. Refer to Attachment 01 78 00-A for the Draft DD FORM 1354. Attach the Real Property receiving Component's completed High Performance and Sustainable Building (HPSB) Checklist for each applicable building to the completed DD 1354, in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. For convenience, a blank fillable PDF DD FORM 1354 may be obtained at the following link:
www.esd.whs.mil/Portals/54/Documents/DD/forms/dd/dd1354.pdf

Submit the completed Checklist for DD FORM 1354 of Installed Building Equipment items. Attach this list to the updated DD FORM 1354.

-- End of Section --

# TRANSFER AND ACCEPTANCE OF DoD REAL PROPERTY

PAGE OF PAGES

**1. FROM** *(Organization Name)*

**2. DATE PREPARED** *(YYYYMMDD)*

**3. PROJECT/JOB NUMBER**

**4. SERIAL NUMBER**

**5. TO** *(Organization - Installation Code and Name)*

**6. RPSUID/SITENAME/ INSTCODE/INSTNAME**

**7. CONTRACT NUMBER(S)**

**7a. RPA PLACED-IN-SERVICE DATE** *(YYYYMMDD)*

**8. TRANSACTION DETAILS**

**a. TYPE** *(X only one box)*

- ☐ ACQUISITION _____
- ☐ TRANSFER BETWEEN SERVICES
- ☐ CAPITAL IMPROVEMENT
- ☐ INVENTORY ADJUSTMENT

**b. WHEN/EVENT** *(X one)*

- ☐ TOTAL ASSET PLACED-IN-SERVICE
- ☐ PARTIAL ASSET PLACED-IN-SERVICE

**c. VERSION** *(X one)*

☐ DRAFT ☐ INTERIM ☐ FINAL

| 9. ITEM NO. | 10a. FACILITY NO. | 10b. RPUID | 11. CATCODE | 12. CATCODE DESCRIPTION | 13. CONS TYPE CODE | 14. SUST CODE | PRIMARY 15. UMA | PRIMARY 16. QUANTITY | SECONDARY 17. UMO | SECONDARY 18. QUANTITY | 19. COST | 20. FUND SOURCE | 21. FUND ORG | 22. RPA INT TYPE CODE | 23. ITEM REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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**24. STATEMENT OF COMPLETION.** The facilities listed hereon are in accordance with maps, drawings, and specifications and change orders approved by the authorized representative of the using agency except for the deficiencies listed on the reverse side.

**a. TITLE** *(Construction Agent/Installation Management Organization Accountable Official/RPAO)*

**c. DATE SIGNED** *(YYYYMMDD)*

**b. TRANSFERRED BY** *(Typed Name and Signature)*

**25. ACCEPTED BY** *(Typed Name and Signature)*

**a. TITLE** *(Installation Management Organization Accountable Official/RPAO)*

**c. DATE SIGNED** *(YYYYMMDD)*

**b. NAME AND SIGNATURE**

**26. PROPERTY VOUCHER NUMBER**



**DD FORM 1354, AUG 2022**

PREVIOUS EDITION IS OBSOLETE.

**27. CONSTRUCTION DEFICIENCIES** *(Attach blank sheet for continuations)*

**28. PROJECT REMARKS** *(Attach blank sheet for continuations)*

## INSTRUCTIONS

**GENERAL.** This form has been designed and issued for acceptance of real property or transfer between the DoD Components.

For detailed instructions on how to fill out this form, please refer to Unified Facilities Criteria 1-300-08.

Existing instructions issued by the DoD Components relative to the preparation of DD Form 1354 are applicable to this revised form to the extent that the various items and columns on the superseded forms have been retained. The DOD Components may promulgate additional instructions, as appropriate.

For detailed information on data inputs and codes, please refer to the latest version of the Real Property Information Model (RPIM) Report and use the RPIM Pick Lists for Block responses: https://extranet.acq.osd.mil/ie/

**SPECIFIC DATA ITEMS.**

**1. From.** Name of the DoD Component.

**2. Date Prepared.** Date of actual preparation. Enter all dates in YYYYMMDD format (Example: March 31, 2010 = 20100331).

**3. Project/Job Number.** Project number on a DD Form 1391 or Individual Job Order Number.

**4. Serial Number.** Sequential serial number assigned by the preparing organization (e.g.,Item 17. 2010-0001).

**5. To.** Name and address of the receiving installation, activity, and Service of the Real Property Accountable Officer (RPAO).

**6. RPSUID/SITENAME/INSTCODE/INSTNAME.** Site Unique Identifier and name or installation code and name where the constructed facility is located.

**7. Contract Number(s).** Contract number(s) for this project.

**7a. RPA Placed-In-Service Date.** The calendar date the asset is accepted for use by DoD.

**8. Transaction Details.**
a. Type of Transaction. X only one box.
For Acquisition Type, refer to the Acquisition Method Code pick list in RPIM.
b. When/Event. When or event causing preparation of DD Form 1354. X only one box.
c. Version. Draft, interim, or final DD Form 1354. X only one box.

**9. Item Number.** Use a separate item number for each facility, no item number for additional usages.

**10a. Facility Number.** An installation specific asset identification number.

**10b. RPUID.** A unique non-intelligent code to permanently identify an asset.

**11. CATCODE.** The real property Category Code (CATCODE) that classifies the designed use of the asset (original or current) and corresponds to the largest quantity of the asset that is utilized for a single purpose (RPA Predominant Design Use CATCODE).

**12. CATCODE Description.** The CATCODE name corresponding with Item 11.

**13. Construction (CONS) Type Code.** The code represents the Construction Type Code and valid values can be found in the RPIM pick list by the same name. Type of construction will be PERM for Permanent or SEMI for Semi-permanent.

**14. Sustainability (SUST) Code. :** This code is also known as the Facility Sustainability Code and valid values can be found in the RPIM pick list by the same name. It indicates whether a facility meets the Guiding Principles of Federal Leadership in High Performance and Sustainable Buildings for buildings greater than 10,000 sq. ft. The list of valid values is: 1, 2, 3, 4.

**15. UMA.** Enter the primary unit of measure accountability for each design use category code for each item of real property.

**16.Quantity.** Enter the total quantity in the unit of measure accountability specified for each item of real property.

**17. UMO.** Enter the appropriate unit of measure operational for capacity/configuration as applicable for the design use category code.

**18. Quantity.** Enter the total quantity of capacity/configuration in the unit of measure operational specified for each item of real property.

**19. Cost.** Enter the total project cost for each item of real property. UFC 1-300-08 contains additional guidance.

**20. Fund Source.** Identify the fund source in this column for each real property asset or item. UFC 1-300-08 contains additional guidance.

**21. Funding Organization.** Identify the organization(s) responsible for funding the acquisition of this real property asset.

**22. RPA Interest Type Code.** This code represents the RPA Interest Type Code and valid values can be found in the RPIM pick list by the same name. The code is used to identify the type of legal interest that DoD holds in a real property asset.

**23. Item Remarks.** Remarks pertaining only to the item number identified in Item 9; show cost sharing.

**24. Statement of Completion.** Typed name, signature, title, and date of signature by the responsible transferring individual or agent. In the case of a real property acceptance action this is signed by the DoD Construction Agent. In the case of a real property transfer this is signed by the Installation Management Organization.

**25. Accepted By.** Typed name, signature, title, and date of signature by the Installation Management Organization RPAO or accepting official.

**26. Property Voucher Number.** Next sequential number assigned by the RPAO in voucher register.

**27. Construction Deficiencies.** List construction deficiencies in project during contractor turnover inspection.

**28. Project Remarks.** Project level remarks and continuation of blocks.

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SECTION 01 78 23

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# SECTION 01 78 23

# OPERATION AND MAINTENANCE DATA

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E1971 | (2005; R 2011) Stewardship for the Cleaning of Commercial and Institutional Buildings |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information onlysubmittals not having a "G" designation are for Contractor Quality Control or Designer of Record approval. Submit the following in accordance with Section 01 33 00SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

O&M Database; G
Training Plan; G
Training Outline; G
Training Content; G

SD-11 Closeout Submittals

Training Video Recording; G
Validation of Training Completion; G

### 1.3 OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data for the provided equipment, product, or system, defining the importance of system interactions, troubleshooting, and long-term preventive operation and maintenance. Compile, prepare, and aggregate O&M data to include clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

#### 1.3.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

### 1.3.2 Package Content

Provide data package content in both English and Japanese, and in accordance with paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES. Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Use Data Package 5 for commissioned items without a specified data package requirement in the individual technical sections. Provide a Data Package 5 instead of Data Package 1 or 2, as specified in the individual technical section, for items that are commissioned.

### 1.3.3 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

### 1.3.4 Commissioning Authority Review and Approval

Submit the commissioned systems and equipment submittals to the Commissioning Authority (CxA) to review for completeness and applicability. Obtain validation from the CxA that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CxA communicates deficiencies to the Contracting Officer. Submit the O&M manuals to the Contracting Officer upon a successful review of the corrections, and with the CxA recommendation for approval and acceptance of these O&M manuals. This work is in addition to the normal review procedures for O&M data.

## 1.4 O&M DATABASE

Develop an editable, electronic spreadsheet based on the equipment in the Operation and Maintenance Manuals that contains the information required to start a preventive maintenance program. As a minimum, provide list of system equipment, location installed, warranty expiration date, manufacturer, model, and serial number.

## 1.5 OPERATION AND MAINTENANCE MANUAL FILE FORMAT

Assemble data packages into electronic Operation and Maintenance Manuals. Assemble each manual into a composite electronically indexed file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete electronically linked operation and maintenance directory.

### 1.5.1 Organization

Bookmark Product and Drawing Information documents using the current version of CSI Masterformat numbering system, and arrange submittals using

the specification sections as a structure. Use CSI Masterformat and UFGS numbers along with descriptive bookmarked titles that explain the content of the information that is being bookmarked.

1.5.2 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

a. Building Number.

b. Project Title.

c. Activity and Location.

d. Construction Contract Number.

e. Prepared For: (Contracting Agency).

f. Prepared By: (Name, title, phone number and email address).

g. Include the disk content on the disk label.

h. Date.

i. Virus scanning program used.

1.6 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

The following are a detailed description of the data package items listed in paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES.

1.6.1 Operating Instructions

Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.6.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. List all residual hazards identified in the Activity Hazard Analysis provided under Section 01 35 26 GOVERNMENT SAFETY REQUIREMENTS. Provide recommended safeguards for each identified hazard.

1.6.1.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.6.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.6.1.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal

Operating Procedures.

1.6.1.5 Emergency Operations

Provide Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.6.1.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.6.1.7 Environmental Conditions

Provide a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.6.1.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.6.1.9 Additional Requirements for HVAC Control Systems

Provide Data Package 5 and the following for control systems:

a. Narrative description on how to perform and apply functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.

b. Full as-built sequence of operations.

c. Copies of checkout tests and calibrations performed by the Contractor (not Cx tests).

d. Full points list. Provide a listing of rooms with the following information for each room:

(1) Floor.

(2) Room number.

(3) Room name.

(4) Air handler unit ID.

(5) Reference drawing number.

(6) Air terminal unit tag ID.

(7) Heating or cooling valve tag ID.

(8) Minimum cfm.

(9) Maximum cfm.

e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.

g. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.6.2 Preventive Maintenance

Provide the following information for preventive and scheduled maintenance to minimize repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.6.2.1 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication required under paragraph OPERATOR SERVICE REQUIREMENTS:

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

c. A Lubrication Schedule showing service interval frequency.

1.6.2.2 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems shall be retested. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.

b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include

electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.6.2.3 Cleaning Recommendations

Provide environmentally preferable cleaning recommendations in accordance with ASTM E1971.

1.6.3 Repair

Provide manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.6.3.1 Troubleshooting Guides and Diagnostic Techniques

Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.6.3.2 Wiring Diagrams and Control Diagrams

Provide point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.6.3.3 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.6.3.4 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.6.3.5 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.6.3.6 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.6.4 Real Property Equipment

Provide a list of installed equipment furnished under this Contract. Include all information usually listed on manufacturer's name plate. In the "EQUIPMENT-IN-PLACE LIST" include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Submit the final list 30 days after transfer of the completed facility.

Key the designations to the related area depicted on the Contract drawings. List the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA

| Description | Specification Section | Manufacturer and Catalog, Model, and Serial Number | Composition and Size | Where Used |
|---|---|---|---|---|

1.6.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.6.5.1 Product Submittal Data

Provide a copy of SD-03 Product Data submittals documented with the required approval.

1.6.5.2 Manufacturer's Instructions

Provide a copy of SD-08 Manufacturer's Instructions submittals documented with the required approval.

1.6.5.3 O&M Submittal Data

Provide a copy of SD-10 Operation and Maintenance Data submittals documented with the required approval.

1.6.5.4 Parts Identification

Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing must show the index, reference, or key number that shall cross-reference the illustrated part to the listed part. Group the parts shown in the listings by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog.

#### 1.6.5.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or Contract documents in order to keep warranties in force. Include warranty information for primary componentsof the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

#### 1.6.5.6 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

#### 1.6.5.7 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

#### 1.6.5.8 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components. Provide final set points.

#### 1.6.5.9 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

#### 1.6.5.10 Field Test Reports

Provide a copy of Field Test Reports (SD-06) submittals documented with the required approval.

#### 1.6.5.11 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

## 1.7 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. The information required in each type of data package follows:

1.7.1 Data Package 1

a. Safety precautions and hazards.

b. Cleaning recommendations.

c. Maintenance and repair procedures.

d. Warranty information.

e. Extended warranty information.

f. Contractor information.

g. Spare parts and supply list.

1.7.2 Data Package 2

a. Safety precautions and hazards.

b. Normal operations.

c. Environmental conditions.

d. Lubrication data.

e. Preventive maintenance plan, schedule, and procedures.

f. Cleaning recommendations.

g. Maintenance and repair procedures.

h. Removal and replacement instructions.

i. Spare parts and supply list.

j. Parts identification.

k. Warranty information.

l. Extended warranty information.

m. Contractor information.

1.7.3 Data Package 3

a. Safety precautions and hazards.

b. Operator prestart.

c. Startup, shutdown, and post-shutdown procedures.

d. Normal operations.

e. Emergency operations.

f. Environmental conditions.

g. Operating log.

h. Lubrication data.

i. Preventive maintenance plan, schedule, and procedures.

j. Cleaning recommendations.

k. Troubleshooting guides and diagnostic techniques.

l. Wiring diagrams and control diagrams.

m. Maintenance and repair procedures.

n. Removal and replacement instructions.

o. Spare parts and supply list.

p. Product submittal data.

q. O&M submittal data.

r. Parts identification.

s. Warranty information.

t. Extended warranty information.

u. Testing equipment and special tool information.

v. Testing and performance data.

w. Contractor information.

x. Field test reports.

1.7.4 Data Package 4

a. Safety precautions and hazards.

b. Operator prestart.

c. Startup, shutdown, and post-shutdown procedures.

d. Normal operations.

e. Emergency operations.

f. Operator service requirements.

g. Environmental conditions.

h. Operating log.

i. Lubrication data.

j. Preventive maintenance plan, schedule, and procedures.

k. Cleaning recommendations.

l. Troubleshooting guides and diagnostic techniques.

m. Wiring diagrams and control diagrams.

n. Repair procedures.

o. Removal and replacement instructions.

p. Spare parts and supply list.

q. Repair work-hours.

r. Product submittal data.

s. O&M submittal data.

t. Parts identification.

u. Warranty information.

v. Extended warranty information.

w. Personnel training requirements.

x. Testing equipment and special tool information.

y. Testing and performance data.

z. Contractor information.

aa. Field test reports.

1.7.5 Data Package 5

a. Safety precautions and hazards.

b. Operator prestart.

c. Start-up, shutdown, and post-shutdown procedures.

d. Normal operations.

e. Environmental conditions.

f. Preventive maintenance plan, schedule, and procedures.

g. Troubleshooting guides and diagnostic techniques.

h. Wiring and control diagrams.

i. Maintenance and repair procedures.

j. Removal and replacement instructions.

k. Spare parts and supply list.

l. Product submittal data.

m. Manufacturer's instructions.

n. O&M submittal data.

o. Parts identification.

p. Testing equipment and special tool information.

q. Warranty information.

r. Extended warranty information.

s. Testing and performance data.

t. Contractor information.

u. Field test reports.

v. Additional requirements for HVAC control systems.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training conducted in English for the systems and equipment specified in the technical specifications. The training must be targeted for the Facilities Management Specialist, building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the Operation and Maintenance Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS. Training must include classroom or field lectures based on the system operating requirements. Notify the Contracting Officer in writing seven (7) calendar days prior of the scheduled instructional services. The location of classroom training requires approval by the Contracting Officer.

3.1.1 Training Plan

Submit a written training plan to the Contracting Officer for approval at least 60 calendar days prior to the scheduled training. Include within the plan the following elements:

a. Equipment included in training.

b. Intended audience.

c. Location of training.

d. Dates of training.

e. Objectives.

f. Outline of the information to be presented and subjects covered including description.

g. Start and finish times and duration of training on each subject.

h. Methods (e.g. classroom lecture, video, site walk-through, actual operational demonstrations, written handouts).

i. Instructor names and instructor qualifications for each subject.

j. List of texts and other materials to be furnished by the Contractor that are required to support training.

k. Description of proposed software to be used for video recording of training sessions.

### 3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.

b. Relevant health and safety issues.

c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.

d. Design intent.

e. Use of O&M Manual Files.

f. Review of control drawings and schematics.

g. Interactions with other systems.

h. Special maintenance and replacement sources.

i. Tenant interaction issues.

### 3.1.3 Training Outline

Provide the Operation and Maintenance Manual Files (Bookmarked PDF) and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

### 3.1.4 Training Video Recording

Record classroom training session(s) on video. Provide to the Contracting Officer two copies of the training session(s) in DVD video recording format. Capture within the recording, in video and audio, the instructors' training presentations including question and answer periods with the attendees. The recording camera(s) must be attended by a person during the recording sessions to assure proper size of exhibits and projections during the recording are visible and readable when viewed as training.

### 3.1.5 Unresolved Questions from Attendees

If, at the end of the training course, there are questions from attendees that remain unresolved, the instructor must send the answers, in writing, to the Contracting Officer for transmittal to the attendees, and the training video must be modified to include the appropriate clarifications.

### 3.1.6 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed, and copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

### 3.1.7 Quality Control Coordination

Coordinate this training with Section 01 45 00.00 10 QUALITY CONTROL.

-- End of Section --

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**05/16**

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SECTION 01 91 00.15 10

TOTAL BUILDING COMMISSIONING
**05/16**

# PART 1 GENERAL

## 1.1 SUMMARY

Commission the building systems listed herein. Employ the services of an independent Commissioning Firm. The Commissioning Firm must be a 1st tier subcontractor of the General or Prime Contractor and must be financially and corporately independent of all other subcontractors. The Commissioning Firm must employ a Lead Commissioning Specialist for the Contractor (CxC) that coordinates all aspects of the commissioning process. Perform Commissioning in accordance with the requirements of the contract specifications and the standard under which the Commissioning Firm's qualifications are approved. In the case of a conflict, the most stringent requirement will prevail.

The Commissioning Specialist for the Government (CxG) is a Government employee. In general, the CxC coordinates the commissioning activities and reports to the Contracting Officer's Representative/CxG, copying the General or Prime Contractor on all results in accordance with Third Party Certification (TPC) requirements. The CxC's responsibilities, along with all other contractors' commissioning responsibilities are detailed in the specifications. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

## 1.2 SYSTEMS TO BE COMMISSIONED

Commission the following systems:

Heating, Ventilating, Air Conditioning, and Refrigeration Systems (HVAC)
Building Automation System
Utility Monitoring and Control System
Lighting Systems
Power Distribution Systems
Service Water Heating Systems
Plumbing Systems
Water Pumping and Mixing Systems
Energy and Water Utility Metering Systems and Sub-Meters
Building Envelope: moisture and thermal integrity and air tightness

## 1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 180 (2012) Standard Practice for Inspection

| | |
|---|---|
| | and Maintenance of Commercial Building HVAC Systems |
| ASHRAE 202 | (2013) Commissioning Process for Buildings and Systems |

ASSOCIATED AIR BALANCE COUNCIL (AABC)

| | |
|---|---|
| ACG Commissioning Guideline | (2005) Commissioning Guideline |

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

| | |
|---|---|
| NEBB Commissioning Standard | (2009) Procedural Standards for Whole Building Systems Commissioning of New Construction; 3rd Edition |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

| | |
|---|---|
| SMACNA 1429 | (1994) HVAC Systems Commissioning Manual, 1st Edition |

## 1.4 COMMUNICATION WITH THE GOVERNMENT

The Lead Commissioning Specialist (CxC) must submit all plans, schedules, reports, and documentation directly to the Contracting Officer's Representative concurrent with submission to the CQC System Manager. The Lead Commissioning Specialist must have direct communication with the Contracting Officer's Representative regarding all elements of the commissioning process; however, the Government has no direct contract authority with the Lead Commissioning Specialist.

## 1.5 SEQUENCING AND SCHEDULING

### 1.5.1 Sequencing

Complete the following prior to starting Functional Performance Tests of mechanical systems:

a. All equipment and systems have been completed, cleaned, flushed, disinfected, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications.

b. Performance Verification Tests of the controls systems have been completed and the Performance Verification Test Report has been submitted and approved in accordance with Specifications.

c. Testing, Adjusting, and Balancing has been completed and the Testing, Adjusting, and Balancing Report, has been submitted and approved in accordance with Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.

d. The building envelope is enclosed according to contract documents with final construction completed.

e. The Pre-Functional Checklists have been submitted and approved.

f. The Certificate of Readiness for mechanical systems has been submitted and approved.

Complete the following prior to starting Functional Performance Tests of the electrical systems:

a. All electrical, power generation, and lighting equipment and systems have been completed, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications.

b. The building envelope is enclosed according to contract documents with final construction completed.

c. Ceiling tiles, floor coverings, and window coverings are in place.

d. The Certificate of Readiness for electrical systems has been submitted and approved.

e. Lamps have completed a minimum 100 hour burn-in period.

1.5.2 Project Schedule

Include the following tasks in the project schedule required by Section 01 32 01.00 10 PROJECT SCHEDULE. Ensure sufficient time is scheduled to accommodate the requirements of this specification section. The order of items listed below is not intended to imply a specified sequence:

a. Submission and approval of the Commissioning Firm and Commissioning Specialist

b. Submission and approval of the Testing, Adjusting, and Balancing (TAB) Firm and TAB Specialist specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

c. Submission of the Design Review Report specified herein.

d. Submission of the Design Review Report specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.

e. Submission and approval of the Construction Phase Commissioning Plan

f. Installation of permanent utilities (gas, water, electric)

g. Building Envelope Construction

h. Submission and approval of the Building Envelope Inspection Checklists

i. Drainage and Vent, Building Sewers, Water Supply Systems and Backflow Prevention Assembly Tests specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE

j. Factory Acceptance Testing for each of the systems to be commissioned as required by technical specifications

k. Manufacturer's Equipment Start-Up for each of the systems to be commissioned.

l. Potable Water System Flushing specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE

m. Operational Tests of the plumbing system specified in Section 22 00 00

PLUMBING, GENERAL PURPOSE.

n. Potable Water System Disinfection specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE

o. Submission and approval of the TAB Schematic Drawings, Report Forms, and Procedures specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.

p. Submission and approval of Duct Air Leakage Test Procedures specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

q. Duct Air Leakage Test Execution specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

r. Submission and approval of the Final Duct Air Leakage Test Report specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

s. Testing, Adjusting, and Balancing (TAB) Field Work required by Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

t. Submission and approval of the TAB Report specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

u. TAB Field Acceptance Testing required by Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

v. Submission and approval of the Start-Up Testing Report.

w. Submission and approval of the Performance Verification Test Procedures.

x. Performance Verification Tests.

y. Performance Verification Test Report.

z. Pre-Functional Checklist Submittal

aa. Functional Performance Testing for each system to be commissioned

bb. Integrated Systems Tests

cc. Post-Test Deficiency Correction for each system to be commissioned

dd. Re-Testing

ee. Endurance Tests

ff. Training for each of the systems to be commissioned

gg. Systems Manual/Computerized Maintenance Management System Manual, Maintenance Plan, and Service Life Plan submission and approval

hh. Submission and approval of the Commissioning Report

ii. Seasonal Testing

## 1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Commissioning Firm; G

Lead Commissioning Specialist

Technical Commissioning Specialists

Commissioning Firm's Contract

SD-06 Test Reports

Design Review Report; G

Interim Construction Phase Commissioning Plan; G

Final Construction Phase Commissioning Plan; G

Building Envelope Inspection Checklists; G

Pre-Functional Checklists; G

Issues Log

Commissioning Report; G

Post-Construction Trend Log Report; G

SD-07 Certificates

Certificate of Readiness; G

SD-10 Operation and Maintenance Data

Training Plan; G

Training Attendance Rosters

Systems Manual; G

Maintenance and Service Life Plans

SD-11 Closeout Submittals

Construction Phase Commissioning Plan; G

Final Commissioning Report; G

## 1.7 COMMISSIONING FIRM

Provide a Commissioning Firm that is certified in commissioning by one of

the following: the AABC Commissioning Group (ACG); the National Environmental Balancing Bureau (NEBB); the International Certification Board/Testing, Adjusting, and Balancing Bureau (ICB/TABB), the Building Commissioning Association (BCA); the Association of Energy Engineers (AEE). The Commissioning Firm must be certified in all systems to be commissioned to the extent such certifications are available from the certifying body. Describe any lapses in certification or disciplinary action taken by the certifying body against the proposed Commissioning Firm or Lead Commissioning Specialist in detail. Any firm or commissioning professional that has been the subject of disciplinary action by the certifying body within the five years preceding contract award is not eligible to perform any duties related to commissioning.

a. Submit the Commissioning Firm's certification of qualifications including the name of the firm and certifications no later than 60 calendar days after Notice to Proceed. Submit four hard copies and an electronic copy.

b. The Commissioning Firm's and Commissioning Specialists' certifications must be maintained for the entire duration of the duties specified herein. If, for any reason, the firm or a specialist loses a certification during this period, immediately notify the Contracting Officer's Representative and submit another Commissioning Firm or Commissioning Specialist for approval. All work specified in this specification section performed by the Commissioning Firm or associated Commissioning Specialists is invalid if the Commissioning Firm or Commissioning Specialist loses its certification prior to contract completion and must be performed by an approved successor.

c. The Commissioning Firm must oversee and assist the General or Prime Contractor with the work specified herein. Submit the Commissioning Firm's Contract including the Scope of Work associated with the paragraph POST-CONSTRUCTION SUPPORT no later than 30 calendar days after approval of the Commissioning Firm. Submit four hard copies and an electronic copy.

### 1.7.1 Lead Commissioning Specialist

The Commissioning Firm must provide a Lead Commissioning Specialist (CxC) that has a minimum of five years of commissioning experience, including two projects of similar size and complexity, and that is one of the following: a NEBB qualified Systems Commissioning Administrator (SCA); ACG Certified Commissioning Authority (CxA); ICB/TABB Certified Commissioning Supervisor; BCA Certified Commissioning Professional (CCP); AEE Certified Building Commissioning Professional (CBCP); University of Wisconsin-Madison Qualified Commissioning Process Provider (QCxP); ASHRAE Building Commissioning Professional (BCxP).

a. Submit the Lead Commissioning Specialist's certification of qualifications including the name of the specialist and firm; certifications; years of experience; and a listing of representative projects of similar size and complexity no later than 60 calendar days after Notice to Proceed. Submit four hard copies and an electronic copy.

b. The Lead Commissioning Specialists certifications must be maintained for the entire duration of the duties specified herein. If, for any reason, the specialist loses a certification during this period, immediately notify the Contracting Officer's Representative and

submit another Lead Commissioning Specialist for approval. All work specified in this specification section to be performed by the Lead Commissioning Specialist is invalid if the Lead Commissioning Specialist loses its certification prior to contract completion and must be performed by an approved successor.

c. The Lead Commissioning Specialist must lead and oversee the commissioning work specified herein and be the primary point of contact for the Government regarding the commissioning work.

1.7.2 Technical Commissioning Specialists

Technical Commissioning Specialists, employed by the Commissioning Firm or financially and corporately independent subcontractor hired by the Commissioning Firm, and that have the following qualifications, must perform the technical work specified herein associated with each system to be commissioned:

a. The technical work associated with mechanical systems including Heating, Ventilating, Air Conditioning, and Refrigeration Systems; Building Automation System; Utility Monitoring and Control System; Service Water Heating Systems; Plumbing Systems; Water Pumping and Mixing Systems; Energy and Water Utility Metering Systems must be performed by a Commissioning Specialist certified by NEBB, ACG, ICB/TABB, or BCA in the commissioning of HVAC systems with five years of experience in the commissioning of HVAC systems.

b. The technical work associated with electrical systems including Lighting Systems; Power Distribution Systems; Power Generation Systems; Renewable Energy Systems must be performed by an engineering technician certified by the InterNational Electrical Testing Association (NETA) or the National Institute for Certification in Engineering Technologies (NICET) with five years of experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

c. The technical work associated with the Building Envelope system must be performed by a registered architect with five years of building envelope design or construction experience.

d. Submit the Technical Commissioning Specialist's certification of qualifications including the name of the specialist and firm; certifications; years of experience; and a listing of representative projects of similar size and complexity no later than 60 calendar days after Notice to Proceed. Submit four hard copies and an electronic copy.

1.7.3 Commissioning Standard

Comply with the requirements of the commissioning standard under which the Commissioning Firm and Specialists qualifications are approved. When the firm and specialists are certified by BCA, AEE, ASHRAE, or the University of Wisconsin-Madison, comply with the requirements of one of the acceptable standards unless otherwise stated herein. The acceptable standards are ACG Commissioning Guideline, NEBB Commissioning Standard, SMACNA 1429, or ASHRAE 202. Comply with applicable NETA and NICET testing standards for electrical systems.

a. Implement all recommendations and suggested practices contained in the

Commissioning Standard and electrical test standards.

b. Use the Commissioning Standard for all aspects of Commissioning, including calibration of instruments.

c. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the Commissioning Standard, adhere to the manufacturer calibration recommendations.

d. All quality assurance provisions of the Commissioning Standard such as performance guarantees are part of this contract.

e. The Commissioning Specialists must develop commissioning procedures for any systems or system components not covered in the Commissioning Standard.

f. Use any new requirements, recommendations, and procedures published or adopted prior to contract solicitation by the body responsible for the Commissioning Standard.

## 1.8 SUSTAINABILITY THIRD PARTY CERTIFICATION (TPC)

The Commissioning Specialists must execute and document the commissioning activities required of the Commissioning Authority for the purposes of complying with the Third Party Certification (TPC) requirements for the project in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Provide all commissioning documentation required to meet the TPC requirements.

## 1.9 ISSUES LOG

The Lead Commissioning Specialist must develop and maintain an Issues Log for tracking and resolution of all deficiencies discovered through commissioning review, inspection, and testing. Include the date of final resolution of issues as confirmed by the Commissioning Specialist. Submit the Issues Log on a monthly basis at a minimum. At any point during construction, any commissioning team member finding deficiencies may communicate those deficiencies in writing to the Commissioning Specialist for inclusion into the Issues Log.

Track construction deficiencies identified in the Issues Log using QCS as specified in Specification Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM).

## 1.10 CERTIFICATE OF READINESS

Prior to scheduling Functional Performance Tests for each system, issue a Certificate of Readiness for the system certifying that the system is ready for Functional Performance Testing. The Certificate of Readiness must include, for each system to be commissioned, all equipment and system start-up reports; Performance Verification Test Reports; completed Building Envelope Inspection Checklists; completed Pre-Functional Checklists; Testing, Adjusting, and Balancing (TAB) Report; HVAC Controls Start-Up Reports; and the Air Leakage Test Reports and Diagnostic Test Reports to the extent applicable to the system. The Contractor; the Lead Commissioning Specialist; the Contractor's Quality Control Representative; the Mechanical, Electrical, Controls, and TAB subcontractor representatives must sign and date the Certificate of Readiness. Submit the Certificate of Readiness for each system no later than 14 calendar

days prior to Functional Performance Tests of that system. Submit four hard copies and an electronic copy. Do not schedule Functional Performance Tests for a system until the Certificate of Readiness for that system receives approval by the Government.

## PART 2 PRODUCTS

Not used

## PART 3 EXECUTION

### 3.1 CONSTRUCTION PHASE

#### 3.1.1 Construction Commissioning Coordination Meeting

The Lead Commissioning Specialist must lead a Construction Commissioning Coordination Meeting no later than 14 days after approval of the Commissioning Firm and Commissioning Specialists to discuss the commissioning process including contract requirements, lines of communication, roles and responsibilities, schedules, documentation requirements, inspection and test procedures, and logistics as specified in this specification section. The Contractor's Superintendent or Project Manager, the Contractor's Quality Control Representative, and the Government must attend this meeting. Invite the User and a Directorate of Public Works Representative, Reserve Support Command Representative, or a Base Civil Engineer Office Representative to attend this meeting.

#### 3.1.2 Construction Phase Commissioning Plan

##### 3.1.2.1 Interim Construction Phase Commissioning Plan

The Lead Commissioning Specialist (CxC) must prepare the Interim Construction Phase Commissioning Plan. Submit the Interim Construction Phase Commissioning Plan no later than 30 calendar days after the Construction Commissioning Coordination Meeting and no later than 14 days prior to the start of construction of the building envelope. Submit four hard copies and an electronic copy.

Identify the commissioning and testing standards and outline the overall commissioning process, the commissioning schedule, the commissioning team members and responsibilities, lines of communication, documentation requirements for the construction phase of the project, and Template Building Envelope Inspection Checklists in the Interim Construction Phase Commissioning Plan. A Template Construction Phase Commissioning Plan is attached to this specification and is available in word format upon request. Please note that the Template Construction Phase Commissioning Plan is provided as a supplement and contains additional detailed requirements not specifically addressed within this specification section. The CxC is required to develop a commissioning plan that is comprehensive in scope and conforms to the requirements of the contract documents.

###### 3.1.2.1.1 Checklists

Download example Building Envelope Inspection Checklists, Pre-Functional Checklists, Functional Performance Test Checklists, and Integrated Systems Test Checklists for specification section 01 91 00.15 TOTAL BUILDING COMMISSIONING at the following location:
http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic

The checklists submitted in the Interim and Final Construction Phase Commissioning Plans must contain the same level of detail shown in the examples. The submitted checklists are not required to match the format of the examples.

3.1.2.1.2 Contents

include the following in the Interim Construction Phase Commissioning Plan:

a. Plan purpose

b. Commissioning scope

c. Systems to be commissioned

d. Examples and description of development of pre-functional, integrated systems test, and functional performance test checklists

e. Building information

f. Contact information for the Commissioning Specialists, the Contracting Officer's Technical Representative, and the Commissioning Team listed in paragraph Commissioning Team

g. Roles and responsibilities

h. Management plan

i. Owner's Project Requirements

j. Description of design reviews by the Commissioning Specialists

k. Description and templates for site observation reports and the issues log

l. Listing and description of required meetings

m. Identification and sequence of commissioning and acceptance tasks for incorporation into the Project Schedule

n. Listing of required submittals to Government and Commissioning Specialists

o. Description of execution of building envelope inspection, pre-functional checks, integrated systems tests, and functional performance tests

p. Description of Endurance Tests

q. Acceptance testing of critical systems as identified in contract documents

r. Operation and maintenance manual requirements

s. Description of training requirements

t. Description of required Systems Manual

u. Description of the Commissioning Report

3.1.2.1.3 Template Building Envelope Inspection Checklists

The Building Envelope Technical Commissioning Specialist must develop the Template Building Envelope Inspection Checklists. Include items that verify the building materials and construction maintain the required thermal and moisture integrity and air tightness of the building envelope system in the Building Envelope Inspection Checklists.

3.1.2.2 Final Construction Phase Commissioning Plan

The Lead Commissioning Specialist (CxC) must prepare the Final Construction Phase Commissioning Plan. Submit the Final Construction Phase Commissioning Plan no later than 30 calendar days prior to the start of Pre-Functional Checks. Submit four hard copies and an electronic copy.

Include the information provided in the Interim Construction Phase Commissioning Plan. In addition, the Technical Commissioning Specialist must develop the Pre-Functional Checklists, Integrated Systems Test Checklists, and Functional Performance Test Checklists for each building, for each system required to be commissioned, and for each component for inclusion in the Final Construction Phase Commissioning Plan.

3.1.2.2.1 Pre-Functional Checklists

The Pre-Functional Checklists must include items for physical inspection or testing that demonstrate that installation and start-up of equipment and systems is complete. See paragraph Pre-Functional Checks for more information.

3.1.2.2.2 Functional Performance Test Checklists

Functional Performance Test Checklists must include procedures that explain, step-by-step, the actions and expected results that will demonstrate that the system performs in accordance with the contract. See paragraph Functional Performance and Integrated Systems Tests for more information. Include the following sections and details appropriate to the systems being tested in the Functional Performance Test Checklists:

a. Notable system features including information about controls to facilitate understanding of system operation

b. Conclusions and recommendations. Conclusions must clearly indicate if system does or does not perform in accordance with contract requirements. Recommendation must clearly indicate that the system should or should not be accepted by the Government.

c. Test conditions including date, beginning and ending time, and beginning and ending outdoor air conditions

d. Attendees

e. Identification of the equipment involved in the test

f. Control system feature identification

g. Point-to-point observations including demonstrating system flow meters and sensors have been calibrated and are correctly displayed on the Operator work station

h. Actuator operation observations demonstrating actuator responses to commands from the control system

i. As-found condition of the system operation

j. List of test items with step numbers along with the corresponding feature or control operation, intended test procedure, expected system response, and pass/fail indication.

k. Space for comments for each test item.

3.1.2.2.3 Integrated Systems Test Checklists

Integrated Systems Test Checklists must include test procedures that explain, step-by-step, the actions and expected results that will demonstrate that the system performs in accordance with the contract. See paragraph Functional Performance and Integrated Systems Tests for more information. Include the following sections in the Integrated Systems Test Checklists:

a. Notable features of the interconnected systems organized by discipline including information to facilitate understanding of system operation

b. Conclusions and recommendations. Conclusions must clearly indicate if the systems do or do not perform in accordance with contract requirements. Recommendation must clearly indicate that the systems should or should not be accepted by the Government

c. Test conditions including date and beginning and ending time

d. Attendees

e. Identification of the equipment and systems involved in the test

f. List of test items with step numbers along with the corresponding feature or control operation, intended test procedure, expected system response, and pass/fail indication.

g. Space for comments for each test item.

3.1.3 Design Review

The Lead Commissioning Specialist and Technical Commissioning Specialists must review the construction contract plans and specifications.

a. Advise the Contracting Officer's Representative of any deficiencies that would prevent the building systems and features from operating or performing effectively and from being adequately maintainable.

b. The Commissioning Specialists must provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation or performance. Submit four hard copies and an electronic copy of the report to the Contracting Officer's Representative no later than 30 days after approval of the Commissioning Specialists.

c. The Lead Commissioning Specialist must participate in a meeting to discuss any items contained in the report no later than 14 calendar

days after submission of the report.

### 3.1.4 Construction Submittals

Provide all submittals associated with the systems to be commissioned, including shop drawings; equipment submittals; test plans, procedures, and reports; and resubmittal's to the Commissioning Specialists. The Technical Commissioning Specialist must review the submittals to the extent necessary to verify that the equipment and system installation will comply with the contract requirements.

### 3.1.5 Inspection and Testing

Demonstrate that all system components have been installed, that each control device and item of equipment operates, and that the systems operate and perform, including interactive operation between systems, in accordance with contract documents and the Owner's Project Requirements. Requirements in related specification sections are independent from the requirements of this section and do not satisfy any of the requirements specified in this specification section. Provide all materials, services, and labor required to perform the Pre-Functional Checks, Building Envelope Inspection, Integrated Systems Tests, and Functional Performance Tests.

#### 3.1.5.1 Commissioning Team

Provide a commissioning representative for each sub-contractor associated with the systems to be commissioned. Each commissioning representative is responsible for coordination of their respective sub-contractor's execution of the commissioning activities and participation in the inspection and testing required by this specification section. The designers listed below are the designers of record for their respective systems. Substitutes must be approved by the Contracting Officer's Representative. The General or Prime Contractor shall provide a detailed schedule of all Functional Performance and Integrated System Testing activities to be accomplished at least 14 calendar days prior to the start date of testing.

##### 3.1.5.1.1 Building Envelope Inspections Team

The following team members must participate in building envelope inspections:

| Designation | Function |
|---|---|
| CxB | Building Envelope Technical Commissioning Specialist |
| QAR | Contracting Officer's Quality Assurance Representative |
| CQC | Contractor's Quality Control Personnel |
| BEC | Contractor's Building Envelope Commissioning Representative |
| AD | Architectural Designer |

##### 3.1.5.1.2 Mechanical System Pre-Functional Checks Team

The following team members must participate in Pre-Functional checks of mechanical systems:

| Designation | Function |
|---|---|
| CxM | Mechanical System Technical Commissioning Specialist |
| QAR | Contracting Officer's Quality Assurance Representative |
| CQC | Contractor's Quality Control Personnel |
| MC | Contractor's Mechanical Commissioning Representative |
| EC | Contractor's Electrical Commissioning Representative |
| CC | Contractor's Controls Commissioning Representative |
| TABC | Contractor's TAB Commissioning Representative |
| PC | Contractor's Plumbing Commissioning Representative |
| IC | Contractor's Irrigation Commissioning Representative |

#### 3.1.5.1.3 Electrical System Pre-Functional Checks Team

The following team members must participate in Pre-Functional checks of electrical systems:

| Designation | Function |
|---|---|
| CxE | Electrical System Technical Commissioning Specialist |
| QAR | Contracting Officer's Quality Assurance Representative |
| CQC | Contractor's Quality Control Personnel |
| EC | Contractor's Electrical Commissioning Representative |

#### 3.1.5.1.4 Mechanical Systems Test Team

The following team members must participate in Functional Performance, Seasonal,and Integrated Systems Testing of mechanical systems:

| Designation | Function |
|---|---|
| CxM | Mechanical System Technical Commissioning Specialist |
| QAR | Contracting Officer's Quality Assurance Representative |
| CQC | Contractor's Quality Control Personnel |

| Designation | Function |
|---|---|
| MC | Contractor's Mechanical Commissioning Representative |
| EC | Contractor's Electrical Commissioning Representative |
| CC | Contractor's Controls Commissioning Representative |
| TABC | Contractor's TAB Commissioning Representative |
| PC | Contractor's Plumbing Commissioning Representative |
| IC | Contractor's Irrigation Commissioning Representative |
| MD | Mechanical Designer |
| PD | Plumbing Designer |

3.1.5.1.5 Electrical Systems Test Team

The following team members must participate in Functional Performance and Integrated Systems Testing of electrical systems:

| Designation | Function |
|---|---|
| CxE | Electrical System Technical Commissioning Specialist |
| QAR | Contracting Officer's Quality Assurance Representative |
| CQC | Contractor's Quality Control Personnel |
| EC | Contractor's Electrical Commissioning Representative |
| ED | Electrical Designer |

3.1.5.1.6 Other Pre-Functional and Functional Performance Participants

The following may participate as team members during Pre-Functional Checks and Functional Performance Testing:

| Designation | Function |
|---|---|
| BCE | Base Civil Engineer Office Representative |
| PWD | Public Works Division Representative |
| User | Using Agent's Representative |

3.1.5.2 Building Envelope Inspection

Document building envelope inspection by the commissioning team using the

approved Template Building Envelope Inspection Checklists. Indicate commissioning team member inspection and acceptance of each Building Envelope Inspection Checklist item by initials at the time they are inspected and found to be in conformance with contract requirements. Inspect checklist items before they become hidden as construction progresses.

a. Submit the completed and initialed Building Envelope Inspection Checklists no later than 7 calendar days after completion of inspection of all checklists items. Submit four hard copies and an electronic copy.

b. The Building Envelope Technical Commissioning Specialist must make at least two site visits to the site to observe construction of the building envelope in-progress. On each visit, the Building Envelope Commissioning Specialist must review the Contractor's in-progress checklists to ensure that the commissioning team is inspecting the building envelope as required.

c. The Building Envelope Technical Commissioning Specialist must witness any building envelope tests. The Building Envelope Technical Commissioning Specialist must review the resulting reports and provide recommendations for correction of any deficiencies or further testing.

3.1.5.3 Pre-Functional Checks

Pre-Functional Checklists from the approved Final Construction Phase Commissioning Plan must be completed by the commissioning team. Complete one Pre-Functional Checklist for each individual item of equipment or for each system required to be commissioned including, but not limited to, ductwork, piping, equipment, fixtures (lighting and plumbing), and controls. Indicate commissioning team member inspection and acceptance of each Pre-Functional Checklist item by initials. Acceptance of each Pre-Functional Checklist item by each team member indicates that item conforms to the construction contract requirements in their area of responsibility. Technical Commissioning Specialist acceptance of each Pre-Functional Checklist item indicates that each item has been installed correctly and in accordance with contract documents and the Owner's Project Requirements. Submit the completed and initialed Pre-Functional Checklists no later than 7 calendar days after completion of inspection of all checklists items for each system. Submit four hard copies and an electronic copy. Include manufacturer start-up checklists associated with equipment with the submission of the Pre-Functional Checklists.

3.1.5.4 Testing, Adjusting, and Balancing (TAB) Report and Field Acceptance Testing

The Mechanical System Technical Commissioning Specialist must review the pre-final TAB Report required by Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Identify any deficiencies to the Contracting Officer's Representative and the Contractor's Quality Control Personnel. Resolve all deficiencies prior to TAB Field Acceptance Testing.

The Mechanical System Technical Commissioning Specialist must witness the TAB Field Acceptance Testing specified by Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Include a certification by the Mechanical Technical Specialist that no outstanding deficiencies exist in the systems relative to Testing, Adjusting, and Balancing with the final

TAB Report submittal.

3.1.5.5 HVAC Controls Test Reports

The Mechanical System Technical Commissioning Specialist must review the Performance Verification Testing Plan, Checklists, and Report. Include a certification by the Mechanical System Technical Commissioning Specialist that the submittals contain no deficiencies or that the submittals do not indicate any deficiencies in the HVAC systems or HVAC control systems with each of these submittals.

3.1.5.6 Tests

3.1.5.6.1 Functional Performance and Integrated Systems Tests

Schedule Functional Performance Tests for each system only after the Certificate of Readiness has been approved by the Government for the system. Correct all deficiencies identified through any prior review, inspection, or test activity before the start of Functional Performance Tests. Perform Integrated Systems Tests only after the Functional Performance Tests for each associated system are completed with all deficiencies resolved and after the related Functional Performance Test Checklists have been signed by each commissioning team member.

a. Functional Performance Tests and Integrated Systems Tests must be performed with the Contracting Officer's Quality Assurance Representative present.

b. Abort Functional Performance Tests or Integrated Systems Tests when any system deficiency prevents the successful completion of the test.

c. Technical Commissioning Specialists must lead and document all Functional Performance Tests and Integrated Systems Tests for the systems to be commissioned with the Contractor and appropriate sub-contractors performing the Functional Performance Tests and Integrated Systems Tests. The representatives listed in the paragraph Commissioning Team must attend the tests. Abort Functional Performance Tests or Integrated Systems Tests when any required commissioning team member is not present for the test.

3.1.5.6.1.1 Checklist

Use the Functional Performance Test and Integrated Systems Test Checklists from the approved Final Construction Phase Commissioning Plan to guide the Functional Performance Tests and Integrated Systems Tests. Functional Performance Tests must be performed for each item of equipment and each system required to be commissioned and verify all sensor calibrations, control responses, safeties, interlocks, operating modes, sequences of operation, capacities, lighting levels, and all other performance requirements comply with construction contract regardless of the specific items listed within the Functional Performance Test and Integrated Systems Test Checklists provided. Testing must progress from equipment or components to subsystems to systems to interlocks and connections between systems. Integrated Systems Tests must be performed for the interactive operation between systems such as HVAC systems, fire protection systems, back-up electrical supply, energy generation systems, and other systems, and verify correct interactive operation, acceptable speed of response, and other contract requirements for both normal and failure modes. Examples of Integrated Systems Tests include the correct operation of HVAC

systems during emergency system activation, correct operation of uninterruptible power supplies or energy generators and connected systems, or lighting system operation during power outage or emergency system activation. The order of components and systems to be tested must be determined by the Technical Commissioning Specialists.

3.1.5.6.1.2 Acceptance

Indicate acceptance of each item of equipment and systems tested by signature of each commissioning team member for each Functional Performance Test or Integrated Systems Test Checklist. The Contractor's Quality Control Representative and the Technical Commissioning Specialists must indicate acceptance after the equipment and systems are free of deficiencies.

3.1.5.6.2 HVAC Test Methods

Perform Functional Performance Tests in accordance with the following:

3.1.5.6.2.1 Prior to Testing

Prior to testing operating modes, sequences of operation, interlocks, and safeties, complete control point-to-point observations, test sensor calibrations, and test actuator commands.

3.1.5.6.2.2 Simulating Conditions

Over-writing control input values through the controls system is not acceptable, unless approved by the Contracting Officer's Representative . Identify proposed exceptions in a protocol submitted to the Contracting Officer's Representative for approval. Before simulating conditions, overwriting values (if approved), or changing set-points, calibrate all sensors, transducers and devices. Below are several examples of exceptions that would be considered acceptable:

a. When varying static pressures inside ductwork can not be simulated within the duct, and where a sensor signals the controls system to initiate sequences at various duct static pressures, it is acceptable to simulate the various pressures with a Pneumatic Squeeze-Bulb Type Signaling Device with gauge temporarily attached to the sensing tube leading to the transmitter. It is not acceptable to reset the various set-points, nor to simulate an electric analog signal (unless approved as noted above).

b. Dirty filter pressure drops can be simulated using sheets of cardboard at filter face.

c. Freeze-stat safeties can be simulated by packing portion of sensor with ice.

d. High outside air temperatures can be simulated with a hair blower.

e. High entering cooling coil temperatures can be used to simulate entering cooling coil conditions.

f. Do not use signal generators to simulate sensor signals unless approved by the Contracting Officer's Representative , as noted above, for special cases.

g. Control set points can be altered. For example, to see the air conditioning compressor lockout work at an outside air temperature below 13 degrees C, when the outside air temperature is above 13 degrees C, temporarily change the lockout set point to be minus 18 degrees C above the current outside air temperature. Caution: Set points are not to be raised or lowered to a point such that damage to the components, systems, or the building structure and/or contents will occur.

h. Test duct mounted smoke detectors in accordance with the manufacturer's recommendations. Perform the tests with air system at minimum airflow condition in ductwork.

i. Test current sensing relays used for fan and pump status signals to control system to indicate unit failure and run status by resetting the set point on the relay to simulate a lost belt or unit failure while the unit is running. Confirm that the failure alarm was generated and received at the control system. After the test is conducted, return the set point to its original set-point or a set-point as indicated by the Contracting Officer's Representative .

3.1.5.6.2.3 Setup

Perform each test under conditions that simulate actual conditions as close as is practically possible. Provide all necessary materials and system modifications to produce the necessary flows, pressures, temperatures, and other conditions necessary to execute the test according to the specified conditions. At completion of the test, return the affected building equipment and systems to their pre-test condition.

3.1.5.6.3 Sample Strategy

Perform Functional Performance Tests and Integrated System Tests for all equipment and systems. Prepare and complete a Functional Performance Test checklist for each piece of equipment or system. Prepare and complete an Integrated Systems Test Checklist for all systems and equipment having interactive operation. Test 100 percent of all HVAC Central Plant equipment and primary air handling units. Test 100 percent of renewable energy systems/equipment. Sample testing of 10 units or twenty percent, whichever is greater, is allowed for HVAC equipment with identical controllers such as air terminal units and fan coil units. Sample testing of twenty percent is allowed for other equipment and systems.

3.1.5.6.4 Seasonal Tests

3.1.5.6.4.1 Initial Functional Performance Tests

Perform Initial Functional Performance Tests as soon as all contract work is completed, regardless of the season. Develop and implement means of artificial loading to demonstrate, to a reasonable level of confidence, the ability of the HVAC systems to handle peak seasonal loads.

3.1.5.6.4.2 Full-Load Conditions

In addition to the Initial Functional Performance Tests, perform Functional Performance Tests of HVAC systems under full-load conditions during peak heating and cooling seasons during outdoor air condition design extremes. Test cooling equipment and systems with the building fully occupied when performing the Functional Performance Tests during

peak cooling season.

Schedule Seasonal Functional Performance Tests in coordination with the Government.

3.1.5.6.4.3 System Acceptance

Systems may be partially accepted prior to seasonal testing if they comply with all construction contract that can be tested during initial Functional Performance Tests. All Functional Performance Test procedures must be completed prior to full systems acceptance.

3.1.5.6.5 Aborted Tests and Re-Testing

Abort Functional Performance Tests, Integrated Systems Tests, or Seasonal Tests if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. reimburse the Government for all costs associated with effort lost due to re-testing due to test failures and aborted tests. These costs must include salary, travel costs, and per diem for Government commissioning team members. Re-test only after all deficiencies identified during the original tests have been corrected.

3.1.5.6.5.1 100 Percent Sample

Systems or equipment for which 100 percent sample size are tested fail if one or more of the test procedures results in discovery of a deficiency and the deficiency cannot be resolved within 5 minutes during the test.

Re-test to the extent necessary to confirm that the deficiencies have been corrected without negatively impacting the performance of the rest of the system.

3.1.5.6.5.2 Less than 100 Percent Sample

For systems tests with a sample size less than 100 percent, if one or more of the test procedures for an item of equipment or a system results in discovery of a deficiency, regardless of whether the deficiency is corrected during the sample tests, the item of equipment or system fails the test.

a. If the system failure rate is 5 percent or less, meaning that 5 percent or less of the equipment or systems tested had at least one deficiency, re-test only on the items which experienced the initial failures.

b. If the system failure rate is greater than 5 percent, meaning that more than 5 percent of equipment or systems tested had at least one deficiency, re-test the items which experienced the initial failures to the extent necessary to confirm that the deficiencies have been corrected . In addition, test another random sample of the same size as the initial sample for the first time. If the second random sample set has any failures, re-test those failed items and all remaining equipment and systems to complete 100 percent testing of that system type.

3.1.6 Training Plan

Develop a training plan which identifies all training required by

specification sections associated with commissioned systems. Include a matrix listing each training requirement, content of the training, the trainer name, trainer contact information, and schedule and location of training. Submit four hard copies and an electronic copy of the Training Plan to the Commissioning Specialists and the Government no later than 30 calendar days prior to the associated training.

Document training attendance using training attendance rosters and provide completed attendance rosters to the Commissioning Specialists and the Government no later than 7 calendar days following the completion of training for each system to be commissioned. Submit four hard copies and an electronic copy..

### 3.1.7 Systems Manual

Prepare and submit a Systems Manual including, for all commissioned systems, the Owner's Project Requirements, system single line diagrams, as-built sequences of operation and controls drawings, as-built control setpoints, recommended schedule for sensor and actuator calibration, recommended schedule of maintenance when not in the O&M manuals, recommended re-testing schedule with proposed testing forms, and full equipment warranty information. Update and resubmit the Systems Manual based on any corrective action taken during the warranty period. Include a signed certification or letter from the Lead Commissioning Specialist with the submittal stating that the Systems Manual is complete, clear, and accurate.

Submit Systems Manual no later than 30 calendar days following completion of Functional Performance Tests. Submit four hard copies and an electronic copy.

### 3.1.8 Maintenance and Service Life Plans

#### 3.1.8.1 Maintenance Plan

Prepare and submit a Maintenance Plan for the project mechanical, electrical, plumbing, and fire protection systems. Prepare the HVAC and refrigeration sections of the Maintenance Plan in accordance with ASHRAE 180. Develop required inspection and maintenance tasks similar to Section 5 of ASHRAE 180 for the other commissioned systems and fire protection systems.

Submit the Maintenance Plan no later than 30 calendar days following the completion of Functional Performance tests. Submit four hard copies and an electronic copy.

#### 3.1.8.2 Service Life Plan

Prepare and submit a Service Life Plan for the building envelope, structural systems, and site hardscape that includes the following for each assembly or component:

a. A description of each including the materials or products.

b. The estimated service life, in years.

c. The estimated maintenance frequency and description of maintenance tasks.

d. The point of maintenance access for the components with estimated service life less than service life of the building.

Submit the Service Life Plan no later than 30 calendar days following the completion of Functional Performance tests. Submit four hard copies and an electronic copy.

## 3.2 COMMISSIONING REPORT

Following the completion of Functional Performance Tests and Integrated Systems Tests, with the exception of Seasonal Tests, the Lead Commissioning Specialist must prepare a Commissioning Report.

a. Include an executive summary describing the overall commissioning process, the results of the commissioning process, any outstanding deficiencies and recommended resolutions, and any seasonal testing that must be scheduled for a later date. Indicate, in the executive summary, whether the systems meet the requirements of the construction contract and the Owner's Project Requirements.

b. Detail any deficiencies discovered during the commissioning process and the corrective actions taken in the report. Include the completed Building Envelope Inspection Checklists, Pre-Functional Checklists, Functional Performance Test Checklists, Integrated Systems Test Checklists, the Commissioning Plans, the Issues Log, control sequences, meeting minutes, progress and site visit reports, Performance Verification Test Reports, Training Attendance Rosters, the Design Review Report, the final TAB Report.

c. Submit the Commissioning Report no later than 14 calendar days following commissioning team acceptance of all Functional Performance Tests and Integrated Systems Tests with the exception of Seasonal Tests. Submit four hard copies and an electronic copy.

d. Following any Seasonal Tests or Post-Construction Activities, update the Final Commissioning Report to reflect any changes and resubmit.

## 3.3 POST-CONSTRUCTION SUPPORT

### 3.3.1 Post-Construction Endurance Test

Perform a one-week Endurance Test once during the peak heating season and once during the peak cooling season during outdoor air condition extremes using the building control system to trend all points necessary to evaluate the installed equipment and system performance or as shown as requiring a trend on the project schedules. If insufficient buffer capacity exists to trend the entire endurance test, upload trend logs during the course of the endurance test to ensure that no trend data is lost. Poll all points shown in the project schedules with an alarm condition at 5 minute intervals. Poll all points shown in the project schedules required for trending, overrides, or graphical displays at 15 minute intervals.

The Mechanical System Commissioning Specialists must review the trend logs from the Endurance Tests to ensure that the systems have stable operation and operate as required by the construction contract and the Owner's Project Requirements. The Commissioning Specialists must provide a Post-Construction Trend Log Report that identifies any deficiencies noted in operation and includes a graphical representation of the trends.

Provide one Trend Log Report for the peak cooling season and one Trend Log Report for the peak heating season. Submit four hard copies and one electronic copy of the Post-Construction Trend Log Reports no later than 14 calendar days following receipt of the trend log data by the Commissioning Specialist.

### 3.3.2 Post-Construction Site Visit

The Commissioning Specialists must visit the building site concurrent with the 9 month warranty inspection to inspect building system equipment and review building operation with the building operating/maintenance staff. The Commissioning Specialists must identify any deficiency of the building systems to operate in accordance with the contract requirements and the Owner's Project Requirements. The Commissioning Specialists must advise the Contracting Officer's Representative of any identified deficiencies and the proposed corrective action. Submit an updated commissioning report and systems manual documenting the results of the post-construction inspection.

# Project Name
# Project Location

---

# TEMPLATE - Construction Phase Commissioning Plan

---

Prepared by:

***Date***

# TEMPLATE - Construction Phase Commissioning Plan

## Summary

The *Construction Phase Commissioning Plan* is developed in draft form for the specific project during the design phase. During the design phase, the plan provides direction for the development of the site-specific commissioning specifications by the design team. During the construction phase, the plan provides direction for the commissioning tasks during construction. The plan focuses on providing support for the specifications and provides forms for the application of the commissioning process.

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# Commissioning Plan—Construction Phase

*Project:* **Project Name**
**Project Location**

**Date:** _____

Cx Plan Version

_x_ TEMPLATE Construction Phase
___ **Final Construction Phase**

## *1. Overview*

### 1.1 Abbreviations and Definitions

The following are common abbreviations used in this document.

| | | | |
|---|---|---|---|
| A/E | Architect and design engineers | FPT | Function Performance Test |
| BOD | Basis of Design | HVAC | Heating, Ventilating and Air Conditioning |
| CxG | Commissioning Specialist for the Government | GC | General contractor |
| | | MC | Mechanical contractor |
| CC | Controls contractor | | |
| COR | Contracting Officer's Representative | PC | Prefunctional Checklist |
| Cx | Commissioning | PE | Project Engineer – Gov't |
| Cx Plan | Commissioning Plan document | PM | Project Manager – Gov't |
| CxC | Commissioning Specialist for the Contractor | Subs | Subcontractors to General |
| DA | Design Agent | | |
| DOR | Designer of Record | TAB | Test and Balance Contractor |
| EC | Electrical contractor | USACE | US Army Corps of Engineers |
| FPC | Fire Protection Contractor | User | Facility User/Occupant – Gov't |

### 1.2 Purpose of the Commissioning Plan

The purpose of the construction phase commissioning plan is to document a plan for the commissioning process during construction.

This plan does not provide a detailed explanation of required testing procedures. In general, this plan identifies roles and responsibilities, systems to be commissioned, commissioning standards and procedures, and sample forms to indicate the level of detail desired. Additionally, this plan does not provide extensive narrative on all commissioning concepts, as this information can be found in commissioning guide references.

### 1.3 Commissioning Scope

Commissioning is a systematic process of ensuring that all building systems perform interactively according to the Owner's Project Requirements (OPR) and contract documents. This is achieved by, beginning in the design phase, documenting the design intent and continuing through construction, acceptance and the warranty period with actual verification of performance.

Commissioning during the construction and acceptance phase of this project is intended to achieve the following specific objectives:

- Ensure that applicable equipment and systems are installed properly and receive adequate operational checkout by installing contractors.
- Verify and document proper performance of equipment and systems.
- Ensure that O&M documentation is complete and is in custody of the owner.
- Ensure that the Owner's operating personnel are adequately trained.

### 1.4 Commissioned System

**(NOTE: THIS IS AN EXAMPLE. THIS IS NOT A COMPLETE LIST FOR THIS PROJECT. THIS MUST BE EDITED FOR EACH PROJECT TO REFLECT ALL EQUIPMENT AND SYSTEMS TO BE COMMISSIONED.)**

The following systems will be commissioned in this project (shall include, but not limited to):

HVAC System (and all integral equipment controls)

_x_ Computer Room Air Conditioning Units*
_x_ Hydronic Hot Water System*
_x_ Chilled Water System*
_x_ Pumps*
_x_ Variable speed drives
_x_ Piping, cleaning and flushing
_x_ Ductwork
_x_ Air handling units (including energy recovery modules, MUAs, coils, etc)*
_x_ Fan Coil Units
_x_ VAV Terminal Units
_x_ Testing, Adjusting and Balancing work
_x_ Unit heaters
_x_ Exhaust Fans
_x_ Building automation system (controlled devices, control loops and system integration)*
_x_ Renewable Energy Systems/Equipment
_x_ Other energy transfer or producing equipment

Electrical Systems

_x_ Automatic Lighting Controls
_x_ Daylighting/dimming controls
_x_ Occupancy Controls

Plumbing

_x_ Domestic hot water system

Other

_x_ Building Air Tightness
_x_ Control system
_x_ Indoor Air Quality
_x_ Water Measurement Devices*
_x_ Energy Measurement Devices*
_x_ Fire Protection Systems*

* Denotes critical equipment

## 2. General Building Information

Owner: **FEDERAL GOVERNMENT**

Project: **PROJECT NAME**

Location: **PROJECT LOCATION**

Building Type (office, court, etc.): Building Type
Square Footage: ###### GSF Number of stories: ##

## 3. Cx Team Data *(primary parties)*

**(NOTE: THIS IS NOT A COMPLETE LIST. THIS IS A TEMPLATE AND SHOULD BE EDITED FOR EACH PROJECT TO INCLUDE CX TEAM MEMBERS.)**

| Team Member | Contact Name | Email Address, Phone |
|---|---|---|
| **Project Manager** | | |
| **Design Team Leader** | | |
| **Project Engineer** | | |
| **General Contractor** | | |
| **Commissioning Specialist Government** | | |
| **Commissioning Specialist Contractor** | | |
| **Mechanical Designer/Eng.** | | |
| **Electrical Designer/Eng.** | | |
| **Tenant Representative** | | |
| **Mechanical Contractor** | | |
| **Electrical Contractor** | | |
| **TAB Contractor** | | |
| **Controls Contractor** | | |
| **Mechanical Independent Technical Review** | | |
| **Architect** | | |

## *4. Roles and Responsibilities (Note this is a template. This must be edited and coordinated with the specifications for this project. Add roles and responsibilities for Cx team members not specifically addressed below such as the Technical Commissioning Specialists.)*

### 4.1 Team Members

The members of the commissioning team consist of the CxC, CxG, PE/COR, GC, A/E (particularly the mechanical engineer), the mechanical contractor, electrical contractor, TAB representative, controls contractor, any other installing subcontractors or suppliers of equipment and those performing technical design review of the construction documents. If known, the Owner's building or plant operator/ engineer is also a member of the commissioning team. Additional information on roles and responsibilities of the CxC and CxG is provided in APPENDIX D.

### 4.2 General Management Plan

The CxC will be hired by the General Contractor. The CxG is a Government employee. In general, the CxC coordinates the commissioning activities and reports to the CxG and Contracting Officer's Representative copying the GC on all results in accordance with LEED. The CxC's responsibilities, along with all other contractors' commissioning responsibilities are outlined herein or detailed in the specifications. The Specifications will take precedence over this Cx Plan. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. Refer to the management protocols section below.

### 4.3 Descriptions of Roles and Responsibilities

General descriptions of the commissioning roles are as follows:

**Commissioning Specialist for the Contractor** (CxC):

a. Directs/Coordinates the Cx process and activities.
b. Coordinates all commissioning schedule and activities with the CxG.
c. Obtain copies of all shop drawings, manufacturer's literature, maintenance information or other information as may be needed for systems to be commissioned.
d. Collect the information needed for development of a complete Commissioning Plan and functional performance tests.
e. Obtain all proposed start-up and Prefunctional Checklists documentation.
f. Obtain updates to all project documentation to reflect all supplemental instructions, addenda or other revisions to the project construction documents.
g. Obtain submittals for all systems to be commissioned including controls system and wiring diagrams and narrative sequences of operation, in time for use in preparing the Functional Test Procedures.
h. Obtain preliminary TAB report, indicating all actual field values recorded, prior to initiation of functional testing.
i. Obtain complete operation and maintenance information and as-built drawings for verification, organization and distribution.
j. Update and finalize the Draft Construction Phase Commissioning Plan.
k. As part of Final Commissioning Plan, develop Prefunctional Checklists and Functional Test Procedures from Contract Documents and final equipment submittals including narrative sequences of operation, control diagrams and software code for execution with the assistance of Contractor staff as required. Sample PC and FPT documents located under Appendix C are examples representing the scope and rigor of the commissioning procedures required, and shall be used as the basis for developing the detailed checklists and functional performance test procedures for all equipment requiring commissioning.

l. Perform site observations to follow installation progress and to verify system installation and readiness for testing.
m. Reviews and implements the contractor Start-up Procedures and Forms
n. Review submittal of all required prefunctional and start-up documentation provided by Contractor for completeness and reasonableness. This includes installation documentation, start-up documentation, point-to-point checklists and preliminary TAB report, prior to initiation of functional testing.
o. Schedule, direct and witness complete functional testing as defined in the Commissioning Plan and Functional Test Procedures. All testing shall be performed by the Contractors and subcontractors, and documented by the Commissioning Specialist.
p. Conduct commissioning meetings.
q. Provide site observation, functional tests or other project reports in a timely manner.
r. Identify and document inconsistencies or deficiencies in system operations and system compliance. System deficiencies shall be forwarded to the Contractor and Contracting Officer and documented in a Communication Log and the CQC system.
s. Provides limited problem resolution assistance.
t. Coordinate the participation of Government's personnel with equipment, component and systems performance verification and participation in required training.
u. When commissioning has been successfully completed, recommend acceptance to the Government.
v. Once all functional tests have been successfully completed and all outstanding issues resolved, the Commissioning Specialist will provide the Contracting Officer with a Final Commissioning Report of all commissioning activities and test results that occurred during the project.
w. Observe and document training of government personnel on commissioning systems and equipment.
x. Develop Systems Manual and obtain all necessary information/documentation needed for inclusion.
y. Perform Post Occupancy Activities.

**Owner/Government Representative** (CxG, COR, PE, or PM):

a. Facilitates and supports the Cx process assuring that all commissioning activities are performed in accordance with LEED requirements and contract documents..
b. Approves the Final Commissioning Plan including PCs and FPTs.
c. Approves the Commissioning Report.
d. Performs construction observation.
e. Has final authority in decision making processes

**General Contractor**:

a. Facilitate the Cx process.
b. Ensure CxC receives copies of all shop drawings, manufacturer's literature, maintenance information or other information as may be needed for systems to be commissioned.
c. Ensure CxC is provided necessary information for updating the Commissioning Plan and development of checklists and functional tests. The Contractor shall review these documents and confirm in writing to the CxC, PE/COR and CxG any known areas of conflict or areas requiring clarifications.
d. Assists in development of Prefunctional Checklists (PC).
e. Ensure all proposed start-up and Prefunctional Checklists documentation is provided to the CxC.
f. Assists in the development of the Functional Performance Testing Procedures and Forms (FPT).
g. Plan for and incorporate all commissioning activities into the construction schedule.

h. Provide a fully operational system per Specifications, started, verified, debugged, calibrated, balanced, tested and under automatic control.
i. Provide qualified personnel to participate in the commissioning tests, including seasonal testing.
j. Provide updates to all project documentation to reflect all supplemental instructions, addenda or other revisions to the project construction documents. Updates and supplemental instructions must be posted to the master set of documentation for review and reference by all Contractors and for the Commissioning Specialist's use.

k. Provide adequate time and resources to support CxC with functional testing of systems to be commissioned.
l. Coordinate participation of the mechanical, electrical, controls and TAB subcontractors, and all Contractor Quality Control personnel in the commissioning process. Ensure that Subs perform their responsibilities.
m. Ensure CxC and CxG receive submittals for all systems to be commissioned including controls system and wiring diagrams and narrative sequences of operation, in time for use in preparing the Functional Test Procedures.
n. Participate in any efforts to finalize sequences of operations with Government and CxC.
o. Verify that coordination, installation, quality control and final testing have been completed such that installed systems and equipment comply with construction documents.
p. Review the Commissioning Plan, interim reports such as issues log and progress reports, and Commissioning Report to include test results and submit comments to the CxC.
q. In a timely manner, address issues identified during construction that may affect the commissioning process or final system performance.
r. Perform start-up and testing of mechanical and electrical equipment and systems and document as required with start-up reports and completion of Prefunctional Checklists. These checklists include installation documentation, start-up documentation, controls point-to-point documentation and calibration documentation, verification that controls sequence of operations meets design intent and TAB final documentation. Reports will be stored in the Contractor's field trailer. Contractor will coordinate efforts to complete the prefunctional documentation.
s. Ensure preliminary TAB report, indicating all actual field values recorded is provided to the CxC and CxG, prior to initiation of functional testing. These reports shall be incorporated in the commissioning field notebook. The final TAB report is distinguished from the preliminary TAB report by the fact that all submittals and corrections shall be approved by the issuance of the final TAB report. All balancing issues and corrections shall have been resolved to the satisfaction of all parties by the final TAB report.
t. Issue a written Certificate of Readiness for each system to CxC, CxG and PE/COR upon completion of all systems work, start-up and Prefunctional Checklists requirements by trade contractors.
u. Responsible for and demonstrate proper system installation and performance (typically through the use of installers, subs and/or manufacturers). Operate equipment and systems as required for functional performance testing. This includes, but is not limited to; manipulating the appropriate controls systems to execute the Functional Test Procedures.
v. Participate in the fine-tuning or troubleshooting of system performance, if either of these measures becomes necessary.
w. Ensure complete operation and maintenance information and as-built drawings is provided to the CxC and CxG for verification, organization and distribution.
x. Provide documentation of training for the systems specified.
y. Provide test equipment required to test all the systems and equipment in this project.
z. Review operating and maintenance data for verification, organization, distribution and conformance to requirement of the Contract Documents.

aa. Provide necessary information/documentation to CxC for inclusion in the Systems Manual.

**Subcontractors**:
- Demonstrate proper system installation and performance.
- Assists in development of Prefunctional Checklists (PC).
- Assists in the development of the Functional Performance Testing Procedures and Forms (FPT).

**Architect/Engineer** (A/E or DOR):
- Develops and updates Basis of Design.
- Incorporates Commissioning requirements in construction documents.
- Performs construction observation.
- Assists in resolving problems.

**Project Manager**:
- Facilitates and supports the Cx process.

# *5. Construction Phase Commissioning Activities*

This section sequentially details the commissioning process by commissioning task or activity.

## 5.1 Construction Commissioning Coordination Meeting

A commissioning scoping meeting is planned and conducted by the CxC early during the construction phase. Cx Team members such as the GC, CxG, PE/COR, A/E, Technical Commissioning Specialists, and the mechanical, electrical, controls, and TAB subs shall attend. The agenda should include but is not limited to:

- Cx party introductions
- Cx process overview
- Management and lines of reporting and communication are determined
- Draft Cx Plan is reviewed
- Roles and Responsibilities
- Proposed Cx Schedule
- Documentation flow and submittal data the CxG will receive
- Review of building systems to be commissioned including intended operation
- Process questions are addressed

The outcome of the meeting is increased understanding by all parties of the commissioning process and their respective responsibilities. The meeting provides the CxC additional information needed to update the *Cx Plan*, including the commissioning schedule.

Prior to this meeting the CxC is given, by the GC, all drawings and specifications and the construction schedule by trade. The CxC keeps notes from the meeting and distributes them, along with the updated Cx Plan, to each team member.

## 5.2 Final Commissioning Plan and Schedule - Construction Phase

The CxC develops a final *Construction Phase Cx Plan* using the information gathered from the scoping meeting. The initial commissioning schedule is also developed and integrated into the construction schedule. The Cx schedule will be adjusted as construction progresses. Reference Project Schedule in Total Building Commissioning Specification.

## 5.3 Site Observation

The CxC will make periodic site visits to observe equipment and system installations. The CxG, selected maintenance personnel and the PE/COR should be notified and may accompany the CxC during these visits. Site visits shall begin regularly by the time 40% of the commissioned systems are installed. The frequency of these visits shall be monthly at a minimum. As construction progresses and mechanical system installation activity increases, CxC representatives will need to increase site observation frequency. The CxC shall provide a site observation report for each visit. Additional CxC visits should include, but not limited to, selective witnessing of DALT, hydrostatic pressure testing, startup, controls startup/point verification, TAB, and spot checking contractor performed Prefunctional Checkout for completeness and accuracy. Observed deficiencies shall be documented and tracked in a construction Cx issues log. The GC will maintain the master issue log.

## 5.4 Periodic Meetings

The CxC attends selected planning and job-site meetings while on site in order to remain informed on construction progress and to update parties involved in commissioning. The PE/COR and GC provide the CxC and CxG with information regarding substitutions, change orders and any supplemental instructions that may affect commissioning equipment, systems or the commissioning schedule. The CxC and CxG may review construction meeting minutes, change orders or requests for information for the same purpose. Later during construction, necessary meetings between various commissioning team parties will be scheduled by the CxC, through the GC, as required to meet the project's needs. These periodic meetings shall initially be held monthly (and may coincide with the CxC site visits) and then more frequently as project nears completion or as requested by the COR or CxG. The COR and CxG should be notified of all meetings. The CxC will provide minutes for these meetings.

## 5.5 Miscellaneous Management Protocols

The following protocols will be used on this project.

| Issue | Protocol |
|---|---|
| Requests for Information (RFI) or formal documentation requests: | The CxC goes first through the GC and CxG. |
| Minor or verbal information and clarifications: | The CxC communicates directly with subcontractors while keeping the CxG, PE/COR and GC informed. |
| Deficiencies notification: | The CxC documents deficiencies through the CxG and PE/COR, but may discuss deficiency issues with GC prior to notifying the CxG and PE/COR. Copies of deficiency reports shall be provided to CxG and PE/COR. |
| Functional Test Scheduling or Training: | The CxC may provide input for (and do some coordination of) testing and training, but does not schedule testing or training. |
| Scheduling Commissioning meetings: | The CxC coordinates date and schedules through GC, CxG, and PE/COR. The GC notifies attendees directly. |
| Significant Change requests: | The CxC has no authority to issue change orders. |
| For making small changes in specified sequences of operations: | The CxC may suggest (to the DOR, for approval by the PE/COR) changes in sequences of operations to improve efficiency or to control or to correct deficiencies. |
| Disagreements between contractors and CxC's interpretations: | Try and resolve with the CxC first. Then work through CxG and GC who will work with CxC directly. |

## 5.6 Progress Reporting and Logs

At the beginning of construction, the CxC provides the PE/COR with monthly C*ommissioning Progress Reports*. Thirty (30) days prior to the startup of the first piece of major equipment, the frequency of progress reports is increased to twice per month, until startup is completed. Thirty (30) days before functional testing of equipment begins, weekly progress reports are required until functional testing and all non-conformance issues are resolved. The CxC may increase the reporting frequency as needed. The progress reports shall include, but are not limited to, an update of the schedule with list of requested schedule changes and new items added to the schedule, a list of new and outstanding deficiencies, and a description of commissioning progress corresponding to the plan. The CxC keeps a log of all commissioning-related issues that require current or future attention using a *Commissioning Issues Log*. Samples of the *Commissioning Progress Report and Commissioning Issues Log* are included in Appendix A.

The CxC regularly communicates with all members of the commissioning team, keeping them apprised of outstanding issues, commissioning progress, and scheduling through memos, progress reports, etc. The CxC maintains all commissioning related materials in an organized notebook to become part of the final Cx report.

## 5.7 Cx Related Submittals and Documentation

### *5.7.1 Standard Submittals*

The CxC provides all Subs responsible for commissioned equipment with commissioning documentation requirements for their respective equipment and systems through the GC. Subcontractor documentation submissions typically coincide with the normal submittal process. At a minimum, this documentation includes manufacturer's installation instructions, start-up and check-out procedures, O&M data, performance data and control drawings. The CxC reviews and approves submissions relative to commissioning issues expressed in the contract documents. CxC recommendations are provided to the DOR, CxG, owner and/or PE/COR as directed.

### *5.7.2 Special Submittals, Notifications and Clarifications*

The Subs, GC or DOR shall notify the CxC within one (1) week of approval of any design intent or operating parameter changes, added control strategies and sequences of operation, or other change orders that may affect commissioned systems. Thirty (30) days prior to performing any applicable tests, the Subs must provide the CxC full procedure details. As TAB phases are completed, a draft TAB report is provided to the CxC with full explanations of approach, methods, results, data table legends, etc. The final TAB report is provided to the CxC and CxG upon completion.

These submittals to the CxC do not constitute O&M manual submittal compliance. Documentation requirements for the O&M manuals are discussed in Section 5.11, herein.

The CxC may request additional design narrative from the DOR and/or the contractor depending on completeness of original bid documents. The CxC may submit written RFIs to contractors through the standard process.

## 5.8 Prefunctional Checklists, Tests and Startup

Prefunctional checklists (PC) are important to ensure that the equipment and systems are installed and operational and that functional performance testing (FPT) may proceed without unnecessary delays. The CxC will assist/develop with commissioning team members detailed prefunctional checklists and start up plans. The CxC shall provide prefunctional checklists and start up plans to CxG for review. Each piece of equipment receives full prefunctional checkout by the GC/Subs. <u>No sampling strategies are used</u>. The

prefunctional checkout for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). Some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). Prefunctional checklists augment and are combined with the manufacturer's start-up checklist.

Contractors typically already perform some, if not all, of the prefunctional checklist items the commissioning authority will recommend. Few contractors actually document in writing the execution of these checklist items. This project requires that the procedures be documented in writing by the installing technician. To document the prefunctional testing and startup process, site technicians performing line item tasks, initial and date each checklist item. Only individuals having direct knowledge of a line item being completed shall check and initial forms. The CxC may not witness all of the prefunctional checks, but will perform spot checks and will witness prefunctional testing of larger or more critical pieces of equipment. Critical equipment requiring witnessing by the CxC is identified in paragraph 1.4 Commissioned Systems.

Subcontractors will execute and sign the prefunctional checks and start up procedures. The GC ensures that each PC is properly completed and provides them to the CxC.

### *5.8.1 Start-up Plan*

The CxC assists the commissioning team members responsible for startup in developing detailed start-up plans for all equipment. The parties responsible for each part of startup and initial checkout are identified on the prefunctional checklists by the GC.

The following procedures will be used for this project: (the Subs are responsible for the plan development)

1. The CxC adapts and enhances, if necessary, the representative prefunctional checklists (PC) and procedures and develops original lists, as necessary.
2. The CxC transmits them to the GC who designates which trade or contractor is responsible to fill out each line item on the Prefunctional Checklist from the CxC. The GC then transmits the checklist to the responsible Subs.
3. The Sub designated to develop the Start-up Plan obtains manufacturer installation, start-up and checkout data, including actual field checkout sheets used by the field technicians.
4. The Sub copies all pages with important instructional data and procedures (not covered in manufacturer field checkout sheets) from the start-up and checkout manuals and adds a signature line in the column by each procedure.
5. The copied pages, along with the prefunctional checklist provided by the GC (originally from the CxC) and the manufacturer field checkout sheets become the "Start-up and Checkout Plan." For systems that may not have adequate manufacturer start-up and checkout procedures, particularly for components being integrated with other equipment, the Sub should provide the added necessary detail and documenting format to the CxC for approval, prior to execution.
6. The GC/Subs transmit the full Start-up Plan to the CxC and CxG for review and approval.
7. The CxC and CxG review and approve the procedures and the format for documenting them, using a standard form, noting any procedures that need to be added, and conveys to the GC. The GC then transmits the full start-up plan to the Subs for their review and use. (This

usually means that the Prefunctional Checklist, alone, will go to more than one Sub, while the full plan will go to the primary installing contractor.)

### *5.8.2 Execution of Checklists and Startup*

Four weeks prior to startup, the GC and Subs shall incorporate the startup and initial checkout activities into the overall construction schedule and notify all applicable parties. The startup and initial checkout plan shall be executed. The CxC, and CxG if available, will observe, at minimum, the procedures for each piece of primary equipment. For components of equipment, (e.g., VAV boxes), the CxC observes a sampling of the prefunctional and start-up procedures.

To document the process of startup and checkout, the site technician performing the line item task initials and dates each paragraph of procedures in the "Startup Plan" and checks off items on the prefunctional and manufacturer field checkout sheets, as they are completed. Only individuals having direct knowledge of a line item being completed shall check or initial the forms.

The Subs and vendors execute the checklists and tests and submit a signed copy of the completed start-up and prefunctional tests and checklists to the CxC. The CxC and CxG may review prefunctional checklists in progress, as necessary.

### *5.8.3 Sampling Strategy for CxC Observation of Prefunctional Checkout and Startup*

**(NOTE: THIS IS AN EXAMPLE. THIS IS NOT A COMPLETE LIST FOR THIS PROJECT. THIS MUST BE EDITED FOR EACH PROJECT TO REFLECT ALL EQUIPMENT AND SYSTEMS TO BE OBSERVED.)**

| Equipment or System | Fraction To Be Observed by CxC |
|---|---|
| Chillers/Boilers/HRCH | 100% |
| Air Handling Units (including Energy Recovery) | 100% |
| Pumps, VFD's | 100% |
| Pipe flushing | At beginning and end |
| Computer Room Units | 100% |
| VAV Terminal Units | 25% |
| Building automation system | 100% review of PVT Report |
| TAB work | 100% review of TAB Report |
| Other misc. equipment/systems | 25% |

### *5.8.4 Deficiencies and Non-Conformance*

The Subs clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully at the bottom of the procedures form or on an attached sheet. The procedures form and deficiencies are provided to the CxC within 48 hours of test completion. The CxC works with the Subs and vendors to correct and retest deficiencies or uncompleted items, involving the CxG, PE/COR and others as necessary. The GC, through installing Subs or vendors, corrects all areas that are deficient or incomplete according to the checklists and tests in a timely manner, and shall notify the CxC as soon as outstanding items have been corrected and resubmit an updated report. Upon satisfactory completion, the CxC recommends approval of the execution of PCs and startup and initial checkout of each system to the CxG and PE/COR using a standard form.

#### *5.8.5 TAB*

The TAB contractor submits the outline of the TAB plan and approach to the CxC and the controls contractor eight weeks prior to starting the TAB. Included in the approach, is an explanation of the intended use of the building control system. The CxC reviews the plan and approach for understanding and coordination issues and may comment, but does not "approve." The controls contractor reviews the feasibility of using the building control system for assistance in the TAB work. The TAB submits weekly written reports of discrepancies, contract interpretation requests and lists of completed tests to the GC, CxC, and CxG. This facilitates quicker resolution of problems and will result in a more complete TAB before functional testing begins. TAB work will not begin until the control system has been prefunctionally tested and approved by the CxC.

#### *5.8.6 Controls Checkout Plan*

The controls contractor develops and submits a written step-by-step plan to the CxC, CxG, and PE/COR through the GC which describes the process they intend to follow in checking out the control system for proper operation. This Controls Checkout Plan shall include forms for the documentation of individual component verification which is considered the Performance Verifications Test (PVT) or Point-to-Point test. Components that are tested and verified on an individual basis are part of the Prefunctional Checks and are documented in conjunction with these forms.

The GC shall verify that the controls contractor reviews the TAB plan with the TAB contractor prior to starting TAB work in order to determine the control system capabilities to aid in executing TAB work. The controls contractor will provide the TAB with any necessary unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.). The controls contractor shall also provide a technician qualified to operate the controls to assist the TAB contractor in performing TAB and the CxC in performing all PCC checkouts.

All CxC required controls prefunctional checklists, calibrations, start-up and selected functional tests of the system shall be completed and approved by the CxC prior to TAB. The GC through the controls contractor shall execute tests and trend logs and remain on site for assistance for mechanical system functional tests.

#### *5.8.7 Certificate of Readiness*

The GC shall issue a Certificate of Readiness certifying that all equipment, systems, and controls are complete and ready for Functional Performance Testing. The Certificate of Readiness shall include all equipment and system start-up reports, Performance Verification Test Reports, Prefunctional Checklists, TAB Report, and the Building Air Tightness Report. The GC and the Mechanical, Electrical, Controls, and Testing, Adjusting, and Balancing Representatives shall sign and date the Certificate of Readiness.

### 5.9 Development of Functional Performance Test and Verification Procedures

#### *5.9.1 Overview*

Functional performance testing (or functional testing) is the dynamic testing of systems (rather than just components) under full automatic operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint, etc). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all of the control system's sequences of operation and components are verified to be responding as the sequences state. The CxC develops the functional performance test procedures in a

sequential written format and coordinates, oversees and documents the actual testing, which is performed by the installing contractor or vendor.

### *5.9.2 Development Process*

Before test procedures are written, the CxC obtains all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, control sequences and setpoints. The CxC develops specific test procedures to verify proper operation of each piece of equipment and system listed in the Cx Plan and Specifications. The CxC obtains clarification, as needed, from contractors and the DOR regarding sequences and operation to develop these tests. Prior to execution, the CxC provides a copy of the equipment and systems functional testing to the installing Sub (through the GC) who reviews the tests for feasibility, safety, warranty and equipment protection. Blank copies of the procedures are input into the O&M manuals for later use by operations staff. The test procedure forms shall include the following, at a minimum:

a. System and equipment or component name(s) and configuration(s).
b. Equipment location and ID number.
c. Unique test ID number, and reference to unique PC and startup documentation ID numbers.
d. Date.
e. Project name.
f. Participating parties.
g. A copy of the specific sequence of operations or other specified parameters being verified.
h. Formulas used in any calculations.
i. Required pre-test field measurements.
j. Instructions for setting up the test, including special cautions, alarm limits, or other equipment-specific information.
k. Specific step-by-step procedures to execute the test in a clear, sequential, and repeatable format.
l. Acceptance criteria of proper performance with a Yes / No check box to allow for clear marking of whether or not proper performance of each part of the test was achieved.
m. A section for comments.
n. Signature and date blocks for the CxC, CxG, Contractor, PE and DOR.

Functional testing and verification shall be achieved by manual testing (persons manipulate the equipment and observe performance) and by monitoring the performance and analyzing the results using the control system's trend log capabilities.

### *5.9.3 Functional Testing Plan Overview*

The CxC develops a testing plan overview to provide the Cx Team with a better idea of where functional testing lies in the schedule, what issues prevent the start of testing, which contractors are needed for each test and how much time might be expected from them. This is developed after most equipment has been started up and when functional testing dates are not too far off. The testing plan overview is provided to the contractors to assist in moving more efficiently to functional testing.

## 5.10 Execution of Functional Testing Procedures

### *5.10.1 Overview and Process*

Functional Performance Testing shall be performed after PCs, startup, calibration, control checkout and TAB are complete and Certificate of Readiness has been submitted for a given system. The CxC schedules functional tests through the GC, CxG, and PE/COR. The CxC directs, witnesses, and documents the functional testing of all equipment and systems according to the Specifications and the Cx Plan. The CxG will oversee/witness the functional testing. The Subs execute the tests, unless otherwise specified. The control system shall be successfully tested before it can be used to verify dependent system and/or component performance. Air and water system balancing shall be complete and reconciled prior to functional testing of related equipment and /or systems. Testing proceeds from components to subsystems to systems and finally to interlocks and connections between systems. The CxC documents the results of the test.

Functional Performance Tests shall be demonstrated to the satisfaction of the CxC. FPTs shall be witnessed and endorsed by the CxC upon satisfactory completion. The CxG recommends acceptance of each test to the PE/COR. The PE/COR gives final approval on each test. The actual testing program shall be conducted in accordance with the approved FPT procedures and shall be documented as required. The GC shall notify the CxG and PE/COR at least 14 calendar days prior to date of each functional performance tests.

### *5.10.2 Deficiencies and Retesting*

Every effort shall be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. Nonconformance and deficiencies observed in materials, installation, or operation shall be addressed immediately, in terms of notification to responsible parties, and providing recommended actions to correct deficiencies. The GC shall have responsibility for resolving construction deficiencies. Corrections of minor deficiencies identified are made during the tests at the discretion of the CxC and CxG. The CxC shall maintain a master deficiency and resolution log, and shall provide the PE and CxG with written progress reports and test results with recommended actions. The CxC shall also document the deficiency and resolution on the test procedure form. Subs correct deficiencies and notify the CxC of corrective action. The CxC schedules retesting through the GC, CxG and PE/COR. Decisions regarding deficiencies and corrections are made at as low a level as possible, preferably between CxC, CxG or PE/COR and the Sub. For areas in dispute, final authority resides with the PM.

### *5.10.3 Facility Staff Participation*

The Owner's facilities operating staff are encouraged to attend and participate in the testing process. The CxC will notify the PE/COR, who will then notify the facility staff when the commissioning events will occur.

### *5.10.4 Sampling*

Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Critical Equipment, requiring 100% of systems/components to be functionally tested, is identified in 1.4 Commissioned Systems. The following table provides additional information on the sampling strategy to be used on this project: **(NOTE: THIS IS AN EXAMPLE. THIS IS NOT A COMPLETE LIST FOR THIS PROJECT. THIS MUST BE EDITED FOR EACH PROJECT TO REFLECT ALL EQUIPMENT AND SYSTEMS TO BE SAMPLED.)**

| Equipment or System | Fraction To Be Observed by CxC |
|---|---|
| Chillers/Boilers/HRCH | 100% |
| Air Handling Units (including Energy Recovery) | 100% |
| Pumps, VFD's | 100% |
| Computer Room Units | 100% |
| Electrical Systems | 20% |
| Domestic Hot Water | 20% |
| Building Air Tightness | 100% |
| Indoor Air Quality | 100% |
| Other misc. equipment/systems | 20% |

## 5.11 Deferred Testing

### *5.11.1 Unforeseen Deferred Tests*

If any check or test cannot be completed due to the building structure, required occupancy condition, or other deficiency, a request for delay execution of checklists and FPT may be delayed contingent on approval of the PM. These tests shall be conducted as soon as possible in the same manner as seasonal testing.

### *5.11.2 Seasonal Testing*

The CxC shall schedule, coordinate, and observe additional testing for seasonal variation in operations and control strategies during the opposite season to verify performance of the HVAC system and controls. The GC shall execute and document tests and correct deficiencies with facilities staff and the CxC, CxG, and/or PE witnessing. Testing shall be completed during the warranty period to fully test all sequences of operation. The GC shall make necessary revisions to O&M manuals and records due to the testing.

a. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed, regardless of season. For the major heating and cooling generation and distribution systems, means of artificial loading shall be developed by the CxC as a means of demonstration, to a reasonable level of confidence, the ability to handle larger peak seasonal loads. Subsequent commissioning shall be undertaken at the appropriate time thereafter to ascertain adequate performance during the different seasons.

b. All equipment and systems shall be tested and commissioned in a peak season to observe full-load performance. Heating equipment shall be tested during winter design extremes. Cooling equipment shall be tested during summer design extremes, with a fully occupied building. Each Contractor and supplier will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance.

c. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. Each Contactor and supplier will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

d. Based on the scheduling of seasonal testing, the Contractor and COR shall discuss/coordinate Beneficial Occupancy and start of warranty period for affected systems.

#### *5.11.3 Short-Term Diagnostic Testing*

After initial occupancy, the GC shall perform short-term diagnostic testing, using data acquisition equipment or the building automation system to record system operation over a two- to three-week period. The dynamic interactions between components in the building system shall be investigated. The scheduling, interaction between heating and cooling, and effectiveness of the HVAC system in meeting the comfort requirements and design conditions shall be evaluated. The GC shall document tests and findings, and correct deficiencies according to the original testing requirements.
.

# *6. Occupancy and Operation Phase Commissioning Activities*

## 6.1 O&M Manuals and Warranties

### *6.1.1 Standard O&M Manuals*

The CxC, CxG, and DOR review the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with the Specifications. They recommend approval and acceptance of these sections of the O&M manuals to the PE/COR. The PE/COR gives final approval on these documents. The CxC, CxG, DOR and PE/COR review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated.

### *6.1.2 Systems Manual*

The CxC will compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the GC, to be included with the O&M manuals.

The Systems Manual shall include the following (ASHRAE Guideline 0, Annex O shall be used for format and content):

a. Index of Systems Manual with notation as to content storage location if not in actual manual.
b. Executive Summary.
c. Owner's Project Requirements.
d. Construction Record Documents, specifications, and approved submittals.
e. A list of recommended operational record-keeping procedures, including sample forms, logs, or other means, and a rationale for each.
f. Ongoing optimization guidance.

g. Operations and maintenance manuals (includes operating procedures for all normal, abnormal, and emergency modes of operation; maintenance procedures; parts and recommended spare parts list; troubleshooting guide; and systems schematics (one-line diagrams).
h. Training materials.
i. Commissioning Report.

## 6.2 Training and Orientation of Owner Personnel

The GC shall provide Owner/Maintenance personnel training and orientation for all commissioned equipment and systems as required by the contract documents. Training will be coordinated by the GC.

## 6.3 Warranty Period

During the warranty period, seasonal testing and other deferred testing required is completed according to the Specifications. The CxC coordinates this activity. Tests are executed and deficiencies corrected by the appropriate Subs, witnessed by CxC, facilities staff, the PE/COR and the CxG. Any final adjustments to the O&M manuals and as-builts due to the testing are made. In addition the CxC will return to the project approximately 10 months into the 12 month warranty period. During this visit(s) the CxC will review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning and review and analyze trend data for compliance to the construction documents. The CxC will also interview facility staff and identify problems or concerns they have operating the building as originally intended. The CxC will make suggestions for improvements and for recording these changes in the O&M manuals. The CxC will identify areas that may come under warranty or under the original construction contract. The CxC will also assist facility staff in developing reports and documents and requests for services to remedy outstanding problems. Results of this inspection shall be documented in the final summary Commissioning Report.

## 6.4 System Performance Verification

The CxC shall review the operation of the building with the operation and maintenance staff and occupants within ten months of facility acceptance by the Government. The CxC shall resolve all outstanding commissioning related issues during the warranty period.

The CxC shall implement a thermal comfort survey of building occupants within a period of six to ten months of facility acceptance by the Government. This survey shall collect anonymous responses about thermal comfort in the buildings, including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems. The CxC shall develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort in the building. This plan shall include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55.

The main parameter to be measured in the thermal comfort survey shall be satisfaction with thermal environment. The answer shall be posed in a seven-point scale format running from very satisfied (+3) to very dissatisfied (-3) with the center (0) signifying the neutral point. The percent dissatisfied shall be the percentage of respondents who answer "dissatisfied" (any of the lower three points of the seven point scale). The survey shall identify each thermal zones by room number(s) and ask the respondent to identify his/her thermal zone. Survey shall include follow-up questions that are asked if the respondent indicates dissatisfaction to identify the nature and cause of the problem. The survey shall be administered in person, over the phone, over networked computers, or on paper. The CxC shall be responsible for collecting each completed survey. The survey shall be consistently applied and available for participation by all regular occupants.

The CxC shall develop a corrective action plan. This plan shall identify each question and the number of responses for each answer of each question. The corrective action plan shall identify the percent dissatisfied for each question. The corrective action plan shall identify the nature and location of any thermal environmental problems. The plan shall suggest directions for corrective actions based on the follow-up questions that identify the nature and cause of the problem.

# 7. Written Work Products

The written work products are described in Appendix B, Formal Written Work Products. The table describes each product, responsible party, due date, recipients, and approving authority.

## 7.1 Final Commissioning Report

A final summary report by the CxG will be provided to the PE/COR within thirty (30) days of substantial completion. The report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For all commissioned equipment, the report should contain the disposition of the commissioning specialist regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

Appendices shall contain control sequences, meeting minutes, progress reports, issues logs, site visit reports, findings, unresolved issues, communications, etc. The commissioning plan, prefunctional checklists and functional tests (along with blanks for the operators) and monitoring data and analysis will be provided.

A copy of the Commissioning Report will be included in the project's LEED documentation.

# 8. Commissioning Schedule

## 8.1 General Issues

**The following sequential priorities are followed:**

1. Equipment shall not be used for heating/cooling during construction until pre-start checklist items and all manufacturers' pre-start procedures have been completed. Moisture, dust and other environmental and building integrity issues must also have been addressed.
2. Equipment/system functional testing shall begin only after prefunctional, startup, and TAB work has been completed.
3. Functional testing of controls system and its controlled equipment shall begin only after all points have been calibrated and prefunctional testing has been completed.
4. TAB shall begin only after the controls system has been approved by the CxC for use for TAB work.
5. TAB work shall begin only after envelope work and ceiling installation have been completed.

# APPENDIX A

## Example Construction Phase Forms

### *COMMISSIONING ISSUES LOG*

**Project:**_____

**Location:**_____

**Prepared by:**_____ **Page** _____ **of** _____

***Attach additional pages as necessary for issues requiring more explanation and tracking.***

| # | Issue | Date Found | Effects | Possible Cause | Recommendations | Actions Taken | O&M Doc. Issue? | Open/ Closed (Date) |
|---|---|---|---|---|---|---|---|---|
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# COMMISSIONING PROGRESS REPORT

Project: _____ Date: _____ Prepared by: _____

Reporting Period: _____ Report #:_____

*Commissioning tasks worked on since last report and general progress:*

_____
_____
_____
_____
_____
_____
_____
_____

*Areas where schedule is not being met:* _____
_____
_____
_____

*Recommended actions:* _____
_____
_____
_____
_____

*Requested schedule adjustments:* _____
_____
_____

*Next steps:* _____
_____

*Other comments (include general comments and field notes):* _____
_____
_____

*Non-Compliance Report attached. (Y/N)* _____ *Issues Log Attached. (Y/N)* _____
*Misc. comment sheets attached. (Y/N)* _____

_____
Commissioning Agent

# APPENDIX B

## Commissioning-Related Formal Written Work Products and Submittals

| Product | Created By | Product Description and Form | Approved By | Product Assigned In |
|---|---|---|---|---|
| Final Cx Plan | CxC | Final Cx plan for const. phase | CxG recommends approval to PE/COR | Cx Plan 5.2 |
| Cx Schedule | GC/CxC/Subs | Schedule of Cx Activities | PE/COR | Cx Plan 7.2 |
| Cx related submittals | GC/Subs | Detailed data on all commissioned equipment | CxC/CxG recommends approval to PE/COR | Cx Plan 5.7 |
| Prefunctional Tests and Checklists | CxC, GC and Subs | List by equipment of prefunctional checklists and prefunctional tests | CxG recommends approval to PE/COR | Cx Plan 5.8 |
| Start-up and initial checkout plans | GC and Subs | Specific listing of procedures for combining CxG prefunctional checklists with Sub's startup and checkout. | CxC/CxG | Cx Plan 5.8.1 |
| Start-up and initial checkout reports | GC and Subs | Filled out prefunctional checklists, tests, startup and initial checkout | CxC/CxG recommends approval to PE/COR | Cx Plan 5.8.2 |
| Controls Contractor Initial Check-out Plan | Controls Contr. | Complete step-by-step plan on checkout and calibration procedures, including forms for documentation | CxC/CxG recommends approval to PE/COR | Cx Plan 5.8.6 |
| TAB plan and approach | TAB | Outline of TAB plan, approach and schedule | CxC; PE/COR | Cx Plan 5.8.5, Specifications |
| TAB progress reports | TAB | List of discrepancies, interpretations needed, tests completed | none | Cx Plan 5.8.5 |
| Draft TAB report | TAB | Draft TAB report with method and results | CxC/CxG (Required for Cx) | Cx Plan 5.7.2 |
| Final TAB report | TAB | Final TAB report with method and results | CxC/CxG (Required for Cx) | Cx Plan 5.7.2 |
| Change orders | GC; PE/COR | Change orders that affect Commissioned equipment | N/A | Cx Plan 5.7.2 |
| Issues Log | CxC | Record / track of all issues and deficiencies | N/A | Cx Plan 5.6 |
| Systems Manual | CxC | Record / track of all submittals, checklists, tests, etc. | N/A | Cx Plan 6.1.2 |

| | | | | |
|---|---|---|---|---|
| Cx progress reports | CxC | Gives scheduling needs and update, deficiency report, Cx progress | N/A | Cx Plan 5.6 |
| Functional Performance Test forms | CxC | Full description of test procedures in "form" format | CxG recommends approval to PE/COR | Cx Plan 5.9 |
| Completed Functional Performance Test forms | CxC | Recorded documentation of the test on the form | CxG recommends approval to PE/COR | Cx Plan 5.9 |
| Final Cx report | CxC | Summary report with status of each system and important findings, etc. Compilation of all important Cx data (checks, tests, issues, reviews, etc.) | CxG recommends approval to PC/COR | Cx Plan 7.1 |
| O&M manuals | GC and Subs | Documentation of design, equipment, operations and maintenance, as-builts, etc. | CxC/CxG recommends approval to PE/COR (required for Cx) | Cx Plan 6.1 and Specifications |
| Thermal Comfort Survey | CxC | Survey used to collect data from building occupants regarding thermal comfort and satisfaction | N/A | Cx Plan 6.3 |
| Corrective Action Plan | CxC | Plan recommending correction action for issues identified during occupancy phase commissioning and thermal comfort survey | N/A | Cx Plan 6.3 |

# APPENDIX C

## Example Prefunctional Checklists, Functional Performance Tests, Integrated System Tests, and Building Envelope Inspection Checklists

Download example Building Envelope Inspection Checklists, Pre-Functional Checklists, Functional Performance Test Checklists, and Integrated Systems Test Checklists for specification section 01 91 00.15 TOTAL BUILDING COMMISSIONING at the following location: **http://www.wbdg.org/FFC/NAVGRAPH/graphtoc.pdf**. The checklists submitted in the Interim and Final Construction Phase Commissioning Plans must contain the same level of detail shown in the examples. The submitted checklists are not required to match the format of the examples.

# APPENDIX D

## CxC and CxG Roles and Responsibilities

| DESIGN PHASE | CxG | CxC |
|---|---|---|
| Ensure that design team has OPR | X | |
| Develop Cx plan (DESIGN PHASE include draft CONSTRUCTION PHASE) | X | |
| Review concept level design submission against OPR | X | |
| Start developing Cx specification | X | |
| Ensure that design concept is in compliance with OPR | X | |
| Develop format for the systems manual | X | |
| Review midpoint design submission against OPR | X | |
| Update and incorporate comments into Cx specification | X | |
| Review completed design documents prior to release for construction against OPR | X | |
| Finalize Cx specification | X | |
| Ensure the completed design documents are in compliance with the OPR prior to release for construction | X | |
| Review Basis of Design (BOD) and concur that it is compliance with the requirements in the OPR | X | |
| Develops format for Construction Phase Cx issues log | X | |
| Develop draft Sample Prefunctional Checklists (PC) | X | |
| Develop draft Sample Functional Performance Tests (FPT) | X | |
| Compile Design Phase Cx report | X | |
| | | |
| **CONSTRUCTION PHASE** | **CxG** | **CxC** |
| Review construction submittals and shop drawings against contract documents and maintain Cx Submittal Log | | X |
| Assure construction submittals and shop drawings have been reviewed by CxC in accordance with Cx Spec, conducting random audits of Cx Submittal log and construction submittals | X | |
| Reviews and recommend approval of Cx schedule | X | X |
| Finalize commissioning plan in accordance with Cx spec | | X |
| Review and recommend approval of Final Commissioning Plan | X | |
| Perform routine inspections | X | X |
| Chairs Cx construction progress meetings | | X |
| Maintains Cx issue log | | X |
| Review Cx issue log | X | |
| Finalize PFC for installed equipment using draft PFC as template | | X |

| | | |
|---|---|---|
| Review and recommend approval of finalized PFC | X | |
| Executes PFC as required (CxC must witness in accordance with Cx Plan) | | X |
| Review and recommend approval of completed PFC | X | |
| Develops FPT for installed equipment using draft FPT as starting point | | X |
| Review and recommend approval of finalized FPT | X | |
| Executes FPT as required by Cx Plan | | X |
| Witness representative sample of FPT during execution | X | |
| Review and recommend approval of completed FPT | X | |
| Compile Construction Phase Cx report | | X |
| Review and approve Construction Phase Cx Report | X | |
| Compile Systems Manual | | X |
| Review and approve Systems Manual | X | |
| Ensure turnover of Systems O&M Manual (by Contractor) to Facility Staff | X | X |
| Submits all Cx documentation required per LEED | X | X |
| Ensure proper Systems O&M training has been provided (by Contractor) to Facility Staff | X | X |
| | | |
| **OCCUPANCY AND OPERATIONS PHASE** | **CxG** | **CxC** |
| Verify any seasonal testing of the facility. | X | X |
| Review the facility and its performance within 10 months of substantial completion. | X | X |
| Within 10 months of substantial completion, review building operation with operations staff and occupants in order to identify any problems in operating the building as originally intended. | X | X |
| Verify training effectiveness of O&M staff within 10 months after substantial completion | X | X |
| Document results of post occupancy review | | X |
| Review post occupancy review documentation | X | |

# ROLES AND RESPONSIBILITIES MATRIX

(excerpt from ER 1110-345-723, Total Building Commissioning Procedures)

| Pre-Design Phase(D-B-B)/RFP Development(D-B) | | CxG = Gov't Comm Specialist<br>COR = Contracting Officer Rep<br>DOR = Designer of Record<br>CxD = Design Comm Specialist<br>CxC = Construction Comm Specialist<br>O&M = Gov't Facility O&M | | | | | L = Lead<br>P =Participate<br>A = Approve<br>R = Review<br>O = Optional<br>N/A = Not Applicable | |
|---|---|---|---|---|---|---|---|---|
| **Commissioning Roles & Responsibilities** | | | | | | | | |
| **Category** | **Task Description** | **CxG** | **COR** | **CxD** | **DOR** | **CxC** | **O&M** | **Notes** |
| Meetings | Pre-Design Kick-Off Meeting | P | P | P | L | N/A | P | |
| | Owner's Project Requirements Meeting | P | P | P | L | N/A | P | |
| | Commissioning Planning Meetings | P | P | L | P | N/A | O | |
| | | | | | | | | |
| Coordination | Coordinate with [COR, DOR, etc.] to ensure that Cx is incorporated into project planning and documents. | L | P | P | P | N/A | O | |
| | | | | | | | | |
| Cx Plan & Spec | Draft Commissioning Plan | R | A | L | R | N/A | R | |
| | | | | | | | | |
| Schedules | Preliminary Commissioning Schedule | R | A | L | R | N/A | O | |
| | | | | | | | | |
| OPR | Prepare Owner's Project Requirements | R | A | P | L | N/A | P | |
| | | | | | | | | |
| | | | | | | | | |
| Commissioning Documents | Identify systems to be commissioned | P | P | L | P | N/A | R | |
| | Preliminary acceptance criteria | R | P | L | P | N/A | R | |
| | Commissioning Documents preliminary templates | R | R | L | R | N/A | R | |

Note: *(Appendix C) is just a sample to depict how such a matrix would be developed. There are many more commissioning tasks to be identified beyond what the sample identifies. The type of involvement shown is for instruction purposes only and would need to be developed on a project by project basis for the scope, size, and complexity of the project, the degree of rigor required, and with consideration of available District resources and expertise.*

| Design Phase (D-B-B) | | CxG = Gov't Comm Specialist<br>COR = Contracting Officer Rep<br>DOR = Designer of Record<br>CxD = Design Comm Specialist<br>CxC = Construction Comm Specialist<br>O&M = Gov't Facility O&M | | | | | L = Lead<br>P =Participate<br>A = Approve<br>R = Review<br>O = Optional<br>N/A = Not Applicable | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Task Description** | **CxG** | **COR** | **CxD** | **DOR** | **CxC** | **O&M** | **Notes** |
| Coordination<br>Cx Plan & Spec<br>Schedules | Coordinate with [COR, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BoD | P | P | P | L | N/A | P | |
| | Preliminary Commissioning Plan | R | A | L | R | N/A | R | |
| | Preliminary Cx Specifications | R | A | L | R | N/A | R | |
| | Design Phase Commissioning Schedule | R | A | P | L | N/A | O | |
| OPR and BoD | Maintain OPR on behalf of Owner | P | P | P | L | N/A | P | |
| | Review Basis of Design Document vs. OPR | R | P | L | P | N/A | P | |
| | Maintain BoD on behalf of Owner | P | P | P | L | N/A | P | |
| Reviews | Focused Concept Design Review | R | L | P | P | N/A | P | |
| | Focused Design Development (35-50%) Review | R | L | P | P | N/A | P | |
| | Focused Construction Document Review | R | L | P | P | N/A | P | |
| | Focused Pre-Final Construction Document | R | L | P | P | N/A | P | |
| | Focused Final Construction Document | R | L | P | P | N/A | P | |
| | Final Construction Document Comment Backcheck | R | L | P | P | N/A | P | |
| Functional | Draft Pre-Functional Checklists (PFC) | R | A | L | R | N/A | R | |
| Test Protocols | Draft System Functional Performance Tests (FPT) | R | A | L | R | N/A | R | |

Note: *(Appendix C) is just a sample to depict how such a matrix would be developed. There are many more commissioning tasks to be identified beyond what the sample identifies. The type of involvement shown is for instruction purposes only and would need to be developed on a project by project basis for the scope, size, and complexity of the project, the degree of rigor required, and with consideration of available District resources and expertise.*

| Design Phase (D-B) | | CxG = Gov't Comm Specialist<br>COR = Contracting Officer Rep<br>DOR = Designer of Record<br>CxD = Design Comm Specialist<br>CxC = Construction Comm Specialist<br>O&M = Gov't Facility O&M | | | | | L = Lead<br>P =Participate<br>A = Approve<br>R = Review<br>O = Optional<br>N/A = Not Applicable | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Task Description** | **CxG** | **COR** | **CxD** | **DOR** | **CxC** | **O&M** | **Notes** |
| Coordination<br>Cx Plan & Spec<br>Schedules | Coordinate with [COR, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BoD | P | P | N/A | L | P | P | |
| | Preliminary Commissioning Plan | R | A | N/A | R | L | R | |
| | Preliminary Cx Specifications | R | A | N/A | R | L | R | |
| | Design Phase Commissioning Schedule | R | A | N/A | L | P | O | |
| OPR and BoD | Maintain OPR on behalf of Owner | P | P | N/A | L | P | P | |
| | Review Basis of Design Document vs. OPR | R | P | N/A | P | L | P | |
| | Maintain BoD on behalf of Owner | P | P | N/A | L | P | P | |
| Reviews | Focused Concept Design Review | R | L | N/A | P | R | P | |
| | Focused Design Development (35-50%) Review | R | L | N/A | P | R | P | |
| | Focused Construction Document Review | R | L | N/A | P | R | P | |
| | Focused Pre-Final Construction Document | R | L | N/A | P | R | P | |
| | Focused Final Construction Document | R | L | N/A | P | R | P | |
| | Final Construction Document Comment Backcheck | R | L | N/A | P | R | P | |
| Functional | Draft Pre-Functional Checklists (PFC) | R | A | N/A | R | L | R | |
| Test Protocols | Draft System Functional Performance Tests (FPT) | R | A | N/A | R | L | R | |

Note: *(Appendix C) is just a sample to depict how such a matrix would be developed. There are many more commissioning tasks to be identified beyond what the sample identifies. The type of involvement shown is for instruction purposes only and would need to be developed on a project by project basis for the scope, size, and complexity of the project, the degree of rigor required, and with consideration of available District resources and expertise.*

## Construction Phase (D-B-B & D-B)

## Commissioning Roles & Responsibilities

CxG= Gov't Comm Specialist
COR = Contracting Officer Rep
CxD = Design Comm Specialist
DOR = Designer of Record
CxC=Construction Comm Specialist
O&M = Gov't Facility O&M

L=Lead
P = Participate
A = Approve
R=Review
O=Optional
N/A=Not Applicable

| Category | Task Description | CxG | COR | CxD | DOR | CxC | O&M | Notes |
|---|---|---|---|---|---|---|---|---|
| Meetings* | Construction Commissioning Kick Off meeting | P | P | N/A | O | L | P | |
| | Commissioning/Issues Resolution Meetings | P | P | N/A | O | L | O | |
| | Project Commissioning Progress Meetings | P | P | N/A | O | L | O | |
| | Controls Meeting | P | P | N/A | P | L | P | |
| Coordination | Coordinate with [COR, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BoD | P | P | N/A | P | L | P | |
| Cx Plan | Final Commissioning Plan w/ final PFCs and FPTs | R | A | N/A | R | L | R | |
| Schedules* | Duration Schedule for Commissioning Activities | R | A | N/A | O | L | R | |
| Doc Reviews* | TAB Plan Review | P | A | N/A | R | P | O | |
| | Submittal and Shop Drawing Review | P | A | N/A | R | P | O | |
| | Review Contractor Equipment Startup Checklists | P | A | N/A | O | P | O | |
| | Review Change Orders, ASI, and RFI | P | A | N/A | R | P | O | |
| Site Observation* | Witness Factory Testing | P | P | N/A | O | P | O | |
| | Construction Observation Site Visits | P | P | N/A | O | P | O | |

Note: *(Appendix C) is just a sample to depict how such a matrix would be developed. There are many more commissioning tasks to be identified beyond what the sample identifies. The type of involvement shown is for instruction purposes only and would need to be developed on a project by project basis for the scope, size, and complexity of the project, the degree of rigor required, and with consideration of available District resources and expertise.*

**For D-B-B acquisition, DOR participation or review for tasks indicated as optional for the DOR should be determined on a case-by-case basis with consideration of scope and complexity of the project/system, availability of resources, and potential benefit of DOR participation/review; these additional services require funding consideration.*

| Acceptance Phase (D-B-B & D-B) | | CxA = Commissioning Authority<br>COR = Contracting Officer Rep<br>CxG= Gov't Comm Consultant<br>A/E = Designer of Record<br>CxC = Construction Comm Specialist<br>O&M = Gov't Facility O&M | | | | | L = Lead<br>P = Participate A<br>= Approve R<br>= Review<br>O = Optional<br>N/A = Not Applicable | |
|---|---|---|---|---|---|---|---|---|
| **Commissioning Roles & Responsibilities** | | | | | | | | |
| **Category** | **Task Description** | **CxG** | **COR** | **CxD** | **DOR** | **CxC** | **O&M** | **Notes** |
| Meetings* | Pre-Test Coordination Meeting | P | P | N/A | O | L | P | |
| | Issues Resolution and Commissioning Report Review Meetings | P | P | N/A | O | L | P | |
| Document Reviews* | Review Completed Pre-Functional Checklists | R | A | N/A | R | L | P | |
| | Pre-Functional Checklist Verification | R | A | N/A | O | L | P | |
| | Review Operations & Maintenance Manuals | R | A | N/A | O | L | P | |
| | Training Plan Review | R | A | N/A | O | L | P | |
| | Warranty Review | R | P | N/A | O | L | P | |
| | Review TAB Report | R | A | N/A | R | P | P | |
| | Systems Manual | R | A | N/A | O | L | R | |
| Site Observations* | Construction Observation Site Visits | P | P | N/A | O | L | P | |
| | Witness Selected Equipment Startup | P | P | N/A | O | P | P | |
| Functional Test Protocols* | TAB Verification | P | A | N/A | O | P | P | |
| | Systems Functional Performance Testing | P | A | N/A | O | L | P | |
| Reports & Logs* | Final Commissioning Report | R | A | N/A | R | L | R | |
| | Submit Final Systems Manuals | R | A | N/A | O | L | R | |

Note: *(Appendix C) is just a sample to depict how such a matrix would be developed. There are many more commissioning tasks to be identified beyond what the sample identifies. The type of involvement shown is for instruction purposes only and would need to be developed on a project by project basis for the scope, size, and complexity of the project, the degree of rigor required, and with consideration of available District resources and expertise.*

**For D-B-B acquisition, DOR participation or review for tasks indicated as optional for the DOR should be determined on a case-by-case basis with consideration of scope and complexity of the project/system, availability of resources, and potential benefit of DOR participation/review; these additional services require funding consideration.*

## Post Occupancy Phase (D-B-B & D-B)

## Commissioning Roles & Responsibilities

CxG= Gov't Comm Specialist
COR = Contracting Officer Rep
CxD = Design Comm Specialist
DOR = Designer of Record
CxC = Construction Comm Specialist
O&M = Gov't Facility O&M

L = Lead
P = Participate
A = Approve
R = Review
O = Optional
N/A = Not Applicable

| Category | Task Description | CxG | COR | CxD | DOR | CxC | O&M | Notes |
|---|---|---|---|---|---|---|---|---|
| Document Reviews* | Systems Monitoring Trended Data | R | R | N/A | R | L | P | |
| | Systems Manuals Update | R | A | N/A | O | L | R | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Site Observations* | Periodic Warranty (4 & 9 Month) Site Visits | P | P | N/A | O | P | P | |
| Functional Test Protocols* | Deferred and/or seasonal Testing | P | A | N/A | O | L | P | |
| | | | | | | | | |
| Technical Activities* | Commissioning/Issues Resolution/Lessons Learned Meetings | P | P | N/A | O | L | P | |
| | Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues | P | P | N/A | O | L | P | |
| Reports and Logs* | Final Commissioning Report Amendment | R | A | N/A | R | L | R | |
| | Issues Logs Closure Report | R | R | N/A | O | L | R | |
| | | | | | | | | |

Note: *(Appendix C) is just a sample to depict how such a matrix would be developed. There are many more commissioning tasks to be identified beyond what the sample identifies. The type of involvement shown is for instruction purposes only and would need to be developed on a project by project basis for the scope, size, and complexity of the project, the degree of rigor required, and with consideration of available District resources and expertise.*

**For D-B-B acquisition, DOR participation or review for tasks indicated as optional for the DOR should be determined on a case-by-case basis with consideration of scope and complexity of the project/system, availability of resources, and potential benefit of DOR participation/review; these additional services require funding consideration.*

# Owner's Project Requirements

April 2026

PREPARED BY:
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**Contract Number:**
W912HV19D0008
**Task Order Number:**
W912HV22F0038

REVISION LOG:

| Revision | Revision Date | Revision Comment |
|---|---|---|
| **0** | 13 September 2022 | Initial Draft |
| **1** | 17 February 2023 | Concept Design 35% |
| **2** | 23 June 2023 | Intermediate Design 65% |
| **3** | 22 September 2023 | Final Design |
| **4** | 2 February 2024 | Backcheck Final Design |
| **5** | 14 April 2026 | RTA |

REVIEWED AND APPROVED BY:

| **USACE PM** | **Date** |
|---|---|
| Ben Xiao | |
| **USACE Representative** | |

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## Overview

The purpose of this document is to provide clear and concise documentation of the Owner's goals, expectations, and requirements for commissioned systems, and shall be utilized throughout the project delivery and commissioning (Cx) process to provide an informed baseline and focus for design development and for validating systems' energy and environmental performance.

The intent of the Owner's Project Requirements Document is to detail the functional requirements of a project and the expectations of the building's use and operation as it relates to commissioned systems. Information about the project is gathered from the users and supplements the designers programming efforts. The OPR forms the basis from which all design, construction, acceptance, and operation decisions are made. The OPR is often modified during the design process as the owner's objectives and criteria are refined.

Updates to the Owner's Project Requirements Document throughout the course of project delivery shall be made by the Design Agent based on decisions and agreements coordinated with and agreed to by the Installation/User/Proponent.

## Owner's Project Requirements

The Owner's Project Requirements (OPR) is a written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, owner's directives, and supporting information. The OPR also includes information to assist the project team to properly plan, design, construct, operate, and maintain systems and assemblies.

The information contained in the OPR supplements the pre - design programming data. Depending on the extent of the programming effort, additional owner objectives and criteria are typically identified through the OPR process. Information provided by the designers is also captured and used to define the owner's objectives and criteria. Supplemental information used by designers such as permitting details, history, or policy issues, etc. do not become part of the OPR.

An effective Commissioning Process depends on a clear, concise, and comprehensive Owner's Project Requirements document. Input should be gathered from all stakeholders. Each item of the OPR shall have defined performance and acceptance criteria.

## Project Description

The DD - 1391, dated 11 May 2021 provides the requirements and shall be the basis for all design documents to repair Tower 4511 at Camp Courtney. This project upgrades and modernizes GOJ built housing tower which was constructed in 1986. It will provide modern and efficient housing for military members and their dependents and will be repaired/restored to meet current life safety codes and to provide a comfortable and appealing living environment comparable to the off-base civilian community.

A Design Charrette was performed by the Project Delivery Team from Tuesday 11 October 2022 through Friday 15 October 2022. Key stakeholders that attended included USACE-JED, 718 CES/AFIMSC Det 2, Air Force and Marine Corps Housing Office, and eiJV and its partnering designers.

**Project Name:** Repair Courtney Tower 4511

**Location:** Camp Courtney, Okinawa, Japan

**Space:**

Project Number: CABT184709

Projected Beneficial Occupancy (BoD) Date: TBD

**Operational Schedule:** The facility will be fully vacant.

**Space Type Usage: Military** Family Housing. (Company Grade Officers (CGO)/Senior Non-Commissioned Officers (SNCO)).

## Applicable References, Codes and Standards

The facility shall be designed in accordance with the following standards:

ANSI/ASHRAE 62.1-2022

ANSI/ASHRAE 62.2-2022

ANSI/ASHRAE 55 - 2019

ANSI/ASHRAE/IESNA Standard 90.1 - 2013

ASHRAE Guideline 0-2019 – The Commissioning Process

ASHRAE Guideline 1.2-2019 – Technical Requirements for The Commissioning Process for Existing

HVAC&R Systems and Assemblies

ASHRAE Standard 202 - 2018 – Commissioning Process for Buildings and Systems

Architectural Barriers Act Standard for Department of defense Facilities

Department of Defense (DOD) Unified Facilities Criteria Program http://www.wbdg.org/ffc/dod

Energy Independence and Security Act (EISA), 19 December 2007, Sec 438,

Executive Order 13693, Planning for Federal Sustainability in the Next Decade, Energy Policy Act of 2005 (EPAct2005), http://www.gpo.gov/fdsys/pkg/PLAW - 109publ58/pdf/PLAW - 109publ58.pdf

Federal Register: December 22, 2008 (Volume 73, Number 246) - EO 13058

FSRIA 2002 Section 9002

Guiding Principles for Sustainable Federal Buildings were updated by the Council on Environmental Quality on February 26, 2016 https://www4.eere.energy.gov/femp/requirements/guidelines_filtering

International Green Construction Code (IGCC)
Japan District Design Guide (JDDG) 6.0 and appendices

2021 NFPA 70 National Electric Code

UFC 1-200-01, DOD Building Code

UFC 1-200-02, High Performance and Sustainable Building Requirements

UFC 2-100-01, Installation Master Planning

UFC 3-101-01, Architecture

UFC 3-110-03, Roofing

UFC 3-201-02, Landscape Architecture

UFC 3-210-10, Low Impact Development

UFC 3-400-02, Design: Engineering Weather Data

UFC 3-410-01, Heating, Ventilating, and Air Conditioning Systems

UFC 4-010-01, DOD Minimum Antiterrorism Standards

UFC 4-010-06, Cybersecurity of Facility-Related Control Systems, With Change 1

UFC 3 - 520 - 01, Interior Electrical Systems

UFC 3 - 530 - 01, Interior and Exterior Lighting Systems and Controls

UFC 3 - 600 - 01, Fire Protection Engineering for Facilities, Change 6, 6 May 2021

UFC 3 - 701 - 01, DoD Facilities Pricing Guide

UFGS 01 74 19, Construction and Demolition Waste Management

UFGS 01 91 00.15, Total Building Commissioning

# Quality Requirements of Materials and Construction

Sustainability shall be a key part of the design of the Accompanies Senior Enlisted Personal Housing Building Tower 4511 at Camp Courtney, Okinawa. The design andconstruction shall follow the high performance and sustainable building principal requirements of the Department of Defense, and the Department of the Air Force, in accordance with federal and Executive Orders. Low Impact Development will be included in the design and construction of this project as appropriate.

The facility shall be designed to meet or exceed the useful service life specified in UFC-1-200-02 High Performance and Sustainable Building Requirements. Facility will incorporate features that provide the lowest practical life cycle cost solutions satisfying the facility requirements with the goal of maximizing energy efficiency.The design shall incorporate materials for an anticipated life of 15 - 30 years. The following specific facility features are required for the design.

### Exterior System and Finishes

The typical existing exterior wall system consists of 150mm cast-in-place concrete over gypsum board metal furring with 50mm thick insulation. The exterior concrete walls shall receive new textured wall paint system with breathable silicone or silicone-enhanced acrylic exterior finish system (EFS) with integral colors and mildewcide to help fight mold and mildew. The exterior paint finish shall match the color palette of the Kadena Architectural Compatibility Guide.

### Moisture Barrier

The air/ moisture barrier paint finish shall be applied directly to the exterior of the concrete walls. The paint finish on the gypsum wall board shall act as a vapor retarder – class I to III vapor retarder can be used or less than 0.1 to 10 vapor permeance can be used. The fluid applied waterproofing over the existing concrete roof deck shall act as the moisture barrier. Windows along the exterior wall assemblies shall be airtight and watertight to prevent moisture and water leakage into the building. Insulating glazing units, thermal breaks, and weather seals and frame joints shall be detailed to prevent air and water leakage.

### Roof

The existing roof consists of 80mm thick water-proof light concrete with asphalt membrane over low-sloped reinforced concrete structural slab. The existing 100mm insulation sits above the gypsum board ceiling. The existing concrete roof deck shall receive new, fluid applied waterproofing and solar reflective top coating depending on the existing condition of the roof.

**Doors and Windows**

The existing windows vary in dimension and types - some are clear anodized glazing with aluminum frame sliding or fixed frames. The existing sliding glass doors in the units are tempered glass with aluminum anodized frame with insect screens. The existing main entrance double doors are clear tempered glazing with stainless steel frames.

The doors and windows shall be selected in accordance with the Kadena Architectural Compatibility Guide, security requirements, UFC 4 - 010 - 01 *DoD Minimum Antiterrorism Standards for Buildings*, PDC TR 12-08 – Rev 1 (Aug. 2013) *Standoff Distances for Japanese Conventional Construction requirements* and JED design guide.

The updated glazing will be single pane or insulating glass (IG) units (determined by the specific application) as described by the UFC and PDC report. All frames and supporting elements (including connected wall elements) will be in accordance with the construction method suggested in the UFC and PDC report, this may require additional structural strengthening at these openings. Exterior windows shall have U-0.60 (IP) overall assembly heat resistance, and curtainwall shall have U-0.45(IP) overall assembly heat resistance. The shading coefficient of the glass will have properties to control the amount of daylight, heat transfer and heat gain into the building.

The exterior doors/ frames and windows shall be either anodized aluminum or factory painted steel. Windows at the residential units shall be operable. The exterior doors shall include continuous perimeter seals to mitigate air infiltration.

The thermal insulation (Imperial Units) shall be according to the following:
Fixed Vertical Fenestration: 0.45 Assembly max. U - value
Operable Vertical Fenestration: 0.60 Assembly max. U - value
Entrance Door Fixed Vertical Fenestration: 0.77 Assembly max. U - value

**Interior Finishes**

The interior finishes shall be highly durable, per the requirements listed in NFPA 101 and UFC 3 - 120 - 10. Japan is a humid and moist climate and special care will be studied to minimize the potential for mold and materialdegradation. The architectural and interior finishes, materials and furnishings will be in accordance with all applicable design guides and adhere to all codes for the health, safety, and welfare of the Facilities users.

The interior design will incorporate the use of suitable local construction methods, materials, and skills consistent with the Facility's design criteria as outlined in the Japan District Guide and Japan Edited Specifications (JES).

## Commissioned Systems

Commissioning of the systems shall meet the requirements of UFC 1 - 200 - 02 High Performance and Sustainable Building Requirements. These requirements shall incorporate commissioning process tenets from International Green Construction Code (IgCC), ASHRAE Standard 202 The Commissioning Process, and UFGS 01 91 00.15 Total Building Commissioning. UFGS 01 91 00.15 identifies affected systemsto be commissioned and at a minimum include:

| Commissioned Systems | |
|---|---|
| **No.** | **System Type** |
| 1 | Heating, Ventilating, Air Conditioning, and Refrigeration Systems (HVAC) |
| 2 | Building Automation System |
| 3 | Utility Monitoring and Control System (as applicable) |
| 4 | Lighting Systems |
| 5 | Power Distribution Systems |
| 6 | Power Generation Systems |
| 7 | Plumbing Systems |
| 8 | Renewable Systems (as applicable) |
| 9 | Building Envelope |

*Table 1 Commissioned Systems*

## Accessibility

The building shall be designed to comply with Architectural Barriers Act (ABA) standards and host nation requirements if applicable.

## Energy Efficiency and Sustainability Goals

The repair Tower 4511 at Camp Courtney shall be designed with sustainability in mind. To the greatest extent practical, this project will be designed in accordance with High Performance and Sustainable Building Requirements as specified by UFC 1 - 200 - 02. UFC 1 - 200 - 2 integrates DoD requirements and industry standards with the Guiding Principles for Sustainable Federal Buildings (Guiding Principles).

### Optimize Energy Performance

The project shall comply with UFC 1-200-02 Section 3-3. The energy consumption of the building will be at least 30% better than ASHRAE 90.1 - 2013 baseline building in accordance with UFC 1 - 200 - 02.

Electrical systems will incorporate LED lighting and automated controls to facilitate occupant comfort and harvesting of daylighting, as feasible.

Building - level metering will be provided for electricity. The meters shall be connected to the base's UMCS for Measurement and Verification.

Energy efficient products shall be consistent with EISA 2007 Section 524 and 525 and DOE's ENERGY STAR, FEMP - designated standards will be included in the Project Manual.

**Protect and Conserve Water**

The project shall comply with UFC 1-200-02 Section 3-4. The indoor water systems shall meet IgCC 601.3.2 (6.3.2), including USEPA WaterSense-labeled products, or Japanese products that meet or exceed WaterSense performance criteria. The cooling towers selected shall be in accordance with IgCC 601.3.3 (6.4.2).

The project is in accordance with DoD Memo Water Use for Landscape Architecture on Department of Defense Installations/Sites, which prohibits potable water use for irrigating new landscaping, other than for plant establishment.

An indoor water meter shall be provided that will connect to the base UMCS for remote water measurements.

**Enhance Indoor Environmental Quality**

The project shall comply with UFC 1-200-02 Section 3-5, which requires compliance with UFC 3-410-01 for ventilation and thermal comfort criteria. The building configuration shall consider maximization of daylighting where feasible. The use of Automated lighting controls shall be provided. A moisture control strategy will be developed. Project specifications will require low - emitting materials. Specifications will also require an Indoor Air Quality construction management plan. Smoking is prohibited within the building and within 50 feet; appropriate signage will be incorporated into the design. Opportunities to voluntarily increase physical activity will be provided as detailed in the Integrated Design Process.

**Reduce Environmental Impact of Materials**

The project shall comply with UFC 1-200-02 Section 3-6. Environmentally preferable products, products containing recycled / bio- based content shall be specified. Ozone depleting and high global warming potential refrigerants will not be used where alternatives (defined by EPA's SNAP program) exist. Provision of space within the building to support local recycling programs will be provided. Specifications will require diversion of 60% of non-hazardous construction and demolition waste from landfills.

## Commissioning

Commissioning shall be in accordance with UFC 1 - 200 - 02 High Performance Sustainable Building Requirements. Commissioning shall also follow International Green Construction Code (IgCC), ASHRAE Standard 202 The Commissioning Process, *and* UFGS 01 91 00.15 Total Building Commissioning.

## Systems Integration Requirements

Specifications shall address the technical requirements for design and installation of the following categories. Systems are to comply with location requirements. The building control system controls the indoor environment,manages energy and fuel consumption, monitors packaged equipment control, and integrates fire alarm and security functions.

Electrical Mechanical

Systems

Metering - Building: Identify the metering types for electrical, gas and water.

Metering – Metering types for electrical and water. Advanced energy metering is still being discussed if required.

Cybersecurity of facility related control systems. Fire Alarm

## Health, Hygiene, and Indoor Environment Requirements

The creation of good indoor environmental quality requires the coordination of many design parameters and construction activities. This includes *(acoustical quality, ventilation rates, materials used to construct the facility, installation sequence, location of makeup air intakes, external and internal pollutant generation, humidity, temperature, and other parameters that may affect occupant comfort).* The following are the known activities that generate pollutants in/near the facility that impact the health, hygiene, and indoor environments of occupants:

- VOC Content in caulks, paints, adhesives, sealants, and cleaning products
- Smoking
- Procedures during construction
- How building materials should be stored in a weather - tight, clean area prior to unpacking for installation.
- Accumulation of water during construction should be avoided and any porous construction materials such as insulation should be protected from moisture.
- Dust in the construction area
- Finishes that emit volatile organic compounds and other pollutants during curing.
- The facility shall be positively pressurized.
- Outside Air Intakes

## Acoustical Requirements

The acoustical requirements shall be designed to avoid interference between telecommunication and sound thatis transmitted. To reduce the interference, panel or partitions shall be used to create sound dampers when both simulations are running at the same time.

The acoustical design shall address applying Sound Absorbing to the ceiling and other surfaces to reduce the noise adjacent space suffers.

An additional acoustical requirement is sound isolation between spaces. Sound rated partition design shall becoordinated with the design team to ensure proper sound transmission requirements can be achieved using Japanese materials and products. If this is unachievable, sound attenuation partition assemblies and other materials from the U.S. may be required.

## Wind, Snow, and Seismic Requirements

Design codes UFC 3-301-01, IBC 2018, ASCE 7-16, JASS 5, JASS 6

Risk Category II (UFC based)

Wind speed

79 m/s as 3 sec gust at ultimate level with 700-year return period (UFC based)

44 m/s as 10-min average speed with 50-year return period (converted to BSLJ datum wind speed)

Ground snow load 0 kN/m$^2$ (not applicable to Okinawa)

Frost depth 0 cm (not applicable to Okinawa)

Seismic design values Ss = 1.73g, S1 = 0.93g, ultimate level (UFC based)

## General Building Requirements

The facilities should be designed to be noncombustible, have low maintenance, and with durable material choices. The climate is warm and humid; therefore, the facilities should be resistant high winds, high humidity, high temperatures, corrosive salt - laden air, and earthquakes. Materials should be selected for ease and speed oferection and resistance to fire, and winds. Any exposed steel or fasteners will be treated with two coats of zinc - rich primer and high - quality polyurethane paint to protect the

structures from corrosion.

A satisfactory building envelope requires strength, durability, and weather resistance. The vapor retarder, insulation and vapor dissipation systems should be properly balanced. The building envelope insulation should meet the minimum requirements of IBC, UFC 1–200–02, and UFC 3–101–01. The building air barrier should comply with UFC 3–101–01; paragraph 3–6.

All occupied spaces should have a daylighting component as required per requirement per UFC 1 - 200 - 02.

## Equipment and System Expectations

The systems shall comply with the sustainability requirements of the Guiding Principles of Sustainable Federal Buildings. Refrigerants utilized for the project (particularly, the chiller system) will meet the Environmental Protection Agency's (EPA's) Significant New Alternatives Policy (SNAP) program.

The mechanical components shall be located to facilitate maintenance to extend component life and provide optimal opportunities for proper and timely maintenance. Adequate clearance for the proper maintenance and repair of equipment is a vital design feature and will be verified through the commissioning process. The major system components will be configured and arranged to allow ease and efficiency in performing routine and scheduled maintenance as well as to facilitate sub - component repair and replacement.

## Heating, Ventilating and Air Conditioning (HVAC)

HVAC systems shall be designed to contribute to overall building energy goals as defined in this document. The HVAC systems will have low life cycle cost and will be capable of providing increased indoor environmental quality to facilitate occupant's productivity while minimizing maintenance requirements. Okinawa is in Climate Zone 2A. Outdoor temperature recommendations shall be according to the United Facilities Guide (UFC).

## Design Parameters

Due to the buildings different spaces and uses, indoor heating and cooling setpoint shall be according to each individual space requirements. Spaces that are applicable to UFC 3 - 410 - 01 shall be designed to a heating temperature of 20 degrees Celsius and a cooling temperature setpoint of 25.6 degrees Celsius.

- Winter Temperature (Dry Bulb / Wet Bulb) 10.6℃ / 8.9℃
- Summer Temperature (Dry Bulb / Wet Bulb) 32.2℃ / 27.2℃

## Building Control System

The building system such as DOAS, multi-split system and domestic cold water lift pump will be individual control. Direct Digital Control (DDC) system is not provided in this project.

## Plumbing

The plumbing system shall be supplied by the existing water, sanitary and storm water sewer services on the site. Water reduction shall be in accordance with Minimum water use reduction shall meet the UFC 1‑200‑02 and lgCC.

## Plumbing Requirements

Plumbing system materials, fixtures, and equipment will be designed and specified, as much as possible, to facilitate installation of Japanese manufactured and locally available products that meet or exceed published US standards.

## Plumbing Systems

The domestic hot water shall be provided by an individual hot water heater tank in each dwelling unit. Individual hot water tank shall be provided where the appliances require hot water in common space. .

Plumbing system materials, fixtures, and equipment will be designed and specified, as much as possible,to facilitate installation of Japanese manufactured and locally available products that meet or exceed published US standards.

## Electrical

High-voltage distribution equipment, including 13.8KV distribution main panel 1, 2, 3 and 125KVA transformer (TR1) and 500KVA transformers (TR2 and TR3), installed indoors will be removed and new equipment will be installed outdoors. The existing outdoor transformer (750KVA) will be used for the new unit HVAC and water heater systems. Will verify existing feeder and electrical system upstream point of connection between new and existing for sufficient capacity to carry the new load and with the installation POC for required AMI meter and the required installation.
If service issues are a concern, replace the wires, cables, 100 AMP Electrical Panels (L-1, L-2, L-E), 225 AMP electrical panels (LP-1 1st floor Unit Main Distribution Panel) and 400 AMP electrical panels (LP-2 to LP-9) . Provide electrical wiring, electrical panel and low voltage transformer for new HVAC and water heater systems.

## Lighting

The lighting in storage and Janitors Closets of core area will be replaced with LED.
Lighting fixtures use LEDs.
In accordance with UFC 3-530-01, fixtures with a color temperature of 4100K or lower and a color rendering index of 80 or higher shall be adopted.
The controls are corridors, stairs, and warehouses in common areas. Occupancy Sensor is adopted for the toilet, and Manual switch is used for the inside of the dwelling unit.

## Fire Protection / Life Safety

The existing Tower is a family housing facility. The IBC occupancy classification is Residential Group R-2 and the NFPA 101 occupancy classification is Residential Existing Apartment Building. The life safety requirements from NFPA 101 will be from Section 31 Existing Apartment Building. In addition, Chapter 34 of NFPA 101 for modification and UFC 3-600-01 Chapter 34 Existing Facilities.

All fire doors within the exterior exit stairs and the interior exit stairs are damaged and/or corroded and need to be replaced. In accordance with NFPA 101 31.2.2.1.2, existing exit enclosures shall have a minimum 1-hr fire resistance rating and 1-hr rated doors and frames.

The exit access doors from the dwelling units to the exterior exit stairs require two actions (turn dead bolt and turn door handle) to enter the stairs. NFPA 101 7.2.1.5.3.4 permits All the doors from dwelling units to exterior exit stairs will require new hardware requiring a single action to enter the exit stairs.

The existing exit stairs appear to allow access to the roof but do not allow re-entry to the exit stairs. The

stairway door that accesses the roof shall either be locked to not allow access to the roof, or the roof door must allow re-entry to the stairway in accordance with NFPA 101 7.2.1.5.8.

The interior exit stair was observed to have the doors on each level held open by either a door block on the floor or tied open using a plastic bag. The local fire department and building manager shall enforce and educate occupants of the code requirement and effects of propping the doors open. Provide signs on the interior exit stair doors. In 2013, a new fire alarm/mass notification system, fire suppression system, standpipe system, detached fire pump house with new underground supply lines to the building were installed. The new fire suppression system included providing fire sprinkler protection to all areas of the building, providing a Class I standpipe system in all stairwells with a minimum flowing 1,000 gpm with a residual pressure of 100 psi at the topmost remote fire hose valve and supplied by a 750 gpm fire pump. In addition, a new combined fire alarm and mass notification system was installed throughout the building.

The exterior concealed fire sprinklers located under the drive through are severely corroded. All the sprinklers need to be replaced with new corrosion resistant sprinklers.

The exterior sidewall sprinklers located on each balcony are slightly corroded. Replace all balcony sidewall sprinklers with new corrosion resistant sprinklers.

The fire sprinkler piping in a couple locations were observed to have severe corrosion due to water dripping on the piping. The sprinkler piping in these locations shall be removed and replaced with new piping and repainted red.

The knox box is located inside the building adjacent to the fire alarm mass notification panel at the front entrance. The knox box needs to be relocated to just outside the front entrance doors as requested by the fire department.

All fire sprinklers disturbed during the renovation of the building shall be replaced with new fire sprinklers.

All smoke and/or CO detectors shall be replaced throughout the building per the SOW. Provide LED textural signs above all exit doors on the first floor and above all doors to the interior stairwell on all floor levels above the level of exit discharge in accordance with UFC 4-021-01.

All the mass notification strobes (amber lenses) shall be removed. All the fire alarm "clear" strobes and speaker/strobes shall be labeled "ALERT" on the device in accordance with USACE ECB 2018-17. There are no local operating consoles (LOC's) located on any level for occupant use in the event of an emergency. Provide an LOC near the FAMN control panel since the ACU microphone is inside the locked panel and outside the interior stairwell on each floor.

## Cybersecurity

The cybersecurity scope on this project is derived from the unique needs to protect against control system failure by designing Facility-Related Control Systems (FRCS) for the appropriate levels of Confidentiality, Integrity, and Availability (C-I-A), in accordance with the mission impact and associated risks.

The process to define the requirements and achieve the desired cybersecurity goals begins with cybersecurity design and is executed and validated per established DoD security criteria. Integrating cybersecurity into the design phase of projects sets the stage for efficient and effective application of security criteria and decreases overall Cybersecurity costs for system authorization and lifecycle management. This approach requires close cooperation and collaboration with the designers, manufacturers, builders, system integrators, system owners, and government stakeholders.

For each FRCS on this project, government defined cybersecurity criteria need to be correlated to the assessed impact, mission requirements, and design constraints in order to tailor an appropriate selection of cybersecurity controls, explicitly defined by Control Correlation Identifiers (CCIs), necessary to reduce risk to an acceptable level. This process, submittals, and applicable standards are defined in UFC 4-10-06 and are required for all FRCS in the scope of this project. Implementation of tailored controls is then specified in serial UFGS 25 05 11 specification sections covering all FRCS. It is important to note that any exceptions to standards are to always be documented in this process.

For each system, applicable CCIs shall be included as part of the Design Analysis and implementation requirements defined under appropriate 25 05 11 UFGS Specification sections. The tailored CCI list will be appended to the Design Analysis and not appended to the UFGS specifications.

**Facility-Related Control Systems within the Scope of the Project**

| System abbr. | System Name |
|---|---|
| **UMCE** | Utility Monitoring System including:<br><br>Utility Metering System (UMS) |

## Building Control System

The building will be provided with Utility Monitoring Control System (UMCS) designed with cybersecurity design requirements as specified under UFC 4-010-06, NIST SP 800-37 Rev. 2, NIST SP 800-53 Rev. 4, NIST SP 800-60 Vol. 2 Rev. 1, NIST SP 800-82 Rev. 2, DoDI 8500.01, DoDI 8570 (DoDD 8140), DoDI 8510.01, JED Design Guide specific criteria.

This cybersecurity design will include the consideration for future connection into the base EMCS.

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US Army Corps
of Engineers
Japan District

# SECTION 01 91 00.15 10
# APPENDIX C –
# DESIGN PHASE COMMISSIONING PLAN

## Repair Courtney Tower 4511
## Camp Courtney, Okinawa, Japan

**A-E Contract No.: W912HV19D0008**
**Task Order No.: W912HV22F0038**
**Project Number: CABT184709**

exp.federal

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Chicago, Illinois 60601
Telephone: 312.616.7500
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**Design Phase Cx Plan**
**APRIL 2026**

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## Overview

The purpose of this Design Phase Commissioning (Cx) Plan is to provide the Project Team with guide documentation to navigate through the Cx process. The Cx process provides a benefit to the Owner by ensuring that systems perform according to the design intent upon project completion. Documentation used in the Cx process is reviewed in detail in this Design Phase Cx Plan and is intended to validate proper system installation and operation.

This Design Phase Cx Plan is a living document and will be updated according to the needs of the Cx Team as Cx progresses throughout the project. This Design Phase Cx Plan also supplements the project specification section for Total Building Commissioning to better explain aspects of the commissioning process.

The Cx Team includes the Owner and operations staff, design team A-E (Architect and Engineer), Contractor, trade contractors, and the Commissioning representatives. The term "CxA" is used throughout this document and refers to the Government's Commissioning Authority. Also, the term "CxC" is used throughout this document and refers to the Contractor's selected Commissioning Specialist.

Enhanced Commissioning efforts are required during the design, construction phase and post-occupancy phases of the project.

In the design phase, the CxA reviews the Basis of Design (BOD), milestone design drawings and specification submissions prepared by the A-E and evaluates whether it meets the Owner's Project Requirements (OPR) and overall project goals. The CxA will submit comments and recommendations based on this review for consideration by the Design Team.

In the construction phase, the Cx process begins with the CxC working with the construction team, to review the design documents and equipment submittals required for commissioning. The CxC will review any applicable submittals for compliance with the OPR, BOD, controls, access and maintenance requirements. CxC comments will be forwarded to the project engineer who is ultimately responsible for the approval or rejection of any submittals. The CxA provides commissioning oversight during the construction phase as a representative to the Government.

Contractors' **Startup Reports (SUR)** will be developed by the responsible contractor or obtained from the equipment manufacturer. The reports will verify that a quality control process is being used to ensure all of the proper parts and pieces are installed, and the equipment is started up according to the manufacturer's recommendations. The completed reports will be collected for review and documentation by the CxC.

The documents used to monitor the quality control process are the CxC's **Pre-Functional Construction Checklists (PFC)**. The mechanical contractor (MC), electrical contractor (EC), test adjust and balance contractor (TABC), have primary responsibility during the installation and startup verification process. The PFCs will establish pass/fail criteria for the functionality and performance of the equipment/system. For Building Enclosure Commissioning (BECx), the PFCs represent an opportunity to document the installation of the individual materials that compose the overall building enclosure. Because they are often covered

by adjacent trades, their completion at the time of installation by the responsible Building Enclosure related subcontractor (BERS) is critical. As part of the quality control plan, the CxA has provided recommendations for items to be included in the pre-functional checklists. Any deviations from the recommendations shall be submitted and reviewed by the CxA prior to implementation.

This project has specified **Functional-Performance Tests (FPT)** for various systems that are incorporated into the Cx Plan. These tests are included as recommendations to the CxC, any deviations from the recommended FPT shall be submitted and reviewed by the CxA prior to implementation. These tests are designed to verify that the systems operate as intended. The contractors are encouraged to execute the tests on their own as part of their checkout process prior to CxC witnessing the contractor testing. After the contractors have completed the required prerequisite documentation (associated PFC(s), Startup Report(s), and TAB report as applicable), the GC must complete and submit a **Cx Test Request Form** (TRF) (see Appendix A) to formally request the CxC be on site to witness the testing. The CxC will then coordinate with the GC to schedule the witnessing of Functional-Performance Tests. The contractors are responsible for successfully executing the tests, and CxC is responsible for witnessing and documenting the test results, with the expectation that the observed results will match the previously submitted documentation.

The construction phase also includes review of the contractor-supplied equipment submittals and **Operation and Maintenance (O&M) Manuals** as well as overseeing the **Owner training** provided by the contractors. The CxC reviews the O&M manuals and comments on whether the information provided is sufficient enough to allow the Owner to operate and maintain the equipment and whether the information is specific to the equipment actually installed on site. The CxC may participate in Owner Training, to ensure the content is proper, the topics covered meet the needs of the Owner, and that an adequate amount of time is provided for each topic.

The post-occupancy and operations phase consists of deficiency follow up. It is inevitable that deficiencies will be discovered during the Cx process. The **Cx Issues Log** will track all deficiencies throughout the Cx process. The contractors are responsible for correcting all deficiencies. Contractors are expected to report to the CxC that issues have been resolved and outline the steps taken in the resolution.

A **10-Month Review** (if required) will be conducted by the CxC to review the building operations after substantial completion. The CxC will interview facility staff, review outstanding issues. The intent of this review is that it be performed within the 12-month warranty period and that any items identified as deficient be brought to the GC's attention for correction prior to the end of the warranty period.

## Project Description and Cx Scope

| | |
|---|---|
| Facility: | 9-Story High Rise Family Housing Structure |
| Usage: | 68 Unit Renovation of Existing Structure |
| Location: | Camp Courtney, Okinawa, Japan |

The following items are included in the CxA's contracted scope of work for Cx oversight and will be tested and/or verified to operate in accordance with the design intent by the CxC:

MECHANICAL SYSTEMS

- DX Mini-split heat pump systems
- Dedicated Outside Air Systems
- General Exhaust Fans
- Toilet Exhaust Fans
- Range Hood(s) exhaust systems
- Dryer venting and booster fan systems

PLUMBING SYSTEMS

- Domestic Water Heating System – Residential Electric

ELECTRICAL SYSTEMS

- Lighting controls– interior and exterior
- Power Distribution
- Emergency Power System

BUILDING ENVELOPE

- Exterior wall systems, glazing systems, and roofing systems
  - Waterproofing
  - Exterior Sheathing
  - Air/Weather Barrier
  - Insulation
  - Rainscreen (if applicable)

## Abbreviations

| | |
|---|---|
| A-E | Architect / Engineer |
| BECx | Building Enclosure Commissioning |
| BERS | Building Enclosure Related Subcontractors |
| BOD | Basis of Design |
| CFR | Current Facility Requirements |
| CM | Construction Manager |
| CPC | Contractor Pre-test Checklist |
| Cx | Commissioning |
| CxA | Government's Commissioning Authority |
| CxC | Contractor's Commissioning Specialist |
| DOR | Designer of Record |
| EC | Electrical Contractor |
| EOR | Engineer of Record |
| FPT | Functional-Performance Test |
| GC | General Contractor |
| MC | Mechanical Contractor |
| O&M | Operation and Maintenance |
| OPR | Owner's Project Requirements |
| PC | Plumbing Contractor |
| PFC | Pre-Functional Construction Checklist |
| PM | Project Manager |
| TAB | Test, Adjust and Balance |
| TRF | Test Request Form |

## Cx Team Members and Their Roles and Responsibilities

Table 1 lists the primary members of the Cx Team and their contact information. If there is information missing it should be filled in at the Cx Kickoff Meeting.

| Team Member | Company & Contact Names | |
|---|---|---|
| Government Design PM | US Army Corps of Engineers | |
| | | Phone: |
| | | E-mail: |
| Government Resident Engineer | US Army Corps of Engineers Savannah District | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| General Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| CxA (Design Phase) | **Exp** Federal Inc. | |
| | Scott Hess, CxA<br>Director of Commissioning | Phone: 1.407.421.7562 |
| | | E-mail: Scott.Hess@exp.com |
| CxC | Name of Company | |
| | Contact #1 | Contact #1 |
| | | E-mail: xxx.xxx@xxx.com |
| Designer of Record | **Exp** Federal Inc. | |
| | Jason Park, AIA, LEED-AP<br>Project Manager | Phone: 1.312.616.7500 |
| | | E-mail: jason.park@expfederal.com |
| Mechanical Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| Electrical Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |

**Table 1 - Cx Team Member Contact Information**

| Team Member | Company & Contact Names | |
|---|---|---|
| Plumbing Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| TAB Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| Air Barrier Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| Roofing Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| Masonry Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| Glazing Contractor | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |
| Air Barrier Testing Company | Name of Company | |
| | Contact #1 | Phone: xxx.xxx.xxxx |
| | | E-mail: xxx.xxx@xxx.com |

**Table 2 - Cx Team Member Contact Information**

Significant construction phase responsibilities for the team members are listed in the following paragraphs and summarized in Table 2.

**CxA** tasks include the following:

- Prepare Design Phase Cx Plan
- Review PFCs and FPTs (as required) as submitted by contractor commissioning agent
- Conduct site visits
- Observe FPT testing for commissioned systems
- Work with contractor commissioning agent to identify and log deficiencies and Cx issues
- Review Cx Reports
- Review O&M Manuals
- Review Systems Manual
- Observe opposite season or deferred testing results for commissioned systems
- Verify Owner Training
- Attend 10-Month Review (if required)

**CxC** tasks include the following:

- Prepare Construction Phase Cx Plan
- Prepare PFCs
- Prepare FPTs
- Conduct site visits
- Sample verify successful equipment installation and startup
- Observe and document FPT results for commissioned systems
- Identify and log deficiencies and Cx issues
- Prepare Cx Reports
- Review O&M Manuals
- Prepare Systems Manual
- Observe and document opposite season or deferred testing results for commissioned systems
- Verify Owner Training
- Lead 10-Month Review (if required)

**A-E** tasks include the following:

- Provide clarifications to design intent as requested
- Review/approve any sequence of operation changes resulting from Cx testing
- Participate as needed in Cx Issue Log item resolutions

**Contractor** tasks include the following:

- Review Cx Plan
- Review FPTs to ensure they are applicable, can actually be performed, and will not damage equipment
- Execute and document quality control process with PFCs and Startup Reports
- Execute FPTs in presence of CxA
- Resolve Cx issues
- Conduct Owner Training
- Provide close-out documentation required for final Cx documents
- Execute opposite season or deferred testing in presence of CxA
- Participate in 10-Month Review (if required)

| COMMISSIONING TASKS | RESPONSIBILITY | | | | | |
|---|---|---|---|---|---|---|
| | CxA | CxC | Owner / A-E | General Contractor | MC / EC / TABC | Controls Contractor |
| OPR, BOD and Design Concepts | Review / Comment | Review | Provide / Revise | No Action | No Action | No Action |
| Early / Mid / Final Design Review | Review / Comment | Review | Provide / Revise | No Action | No Action | No Action |
| Incorporate Cx Requirements into the Bid documents (specifications) | Write / Issue | Review | Incorporate Cx Specs | Review | Review | Review |
| Develop Design Phase Cx Plan | Create/ Update | Review | Review | Review | Review | Review |
| Develop Construction Phase Cx Plan | Review | Create | Review | Review | Review | Review |
| Equipment Submittals | Review / Comment | Review / Comment | Incorporate CxA comments | Provide / Revise | Provide / Revise | Provide / Revise |
| BECx Kickoff Meeting early construction phase | Attend | Attend | Attend | Attend | Lead (BECx) | No Action |
| Cx Kickoff Meeting early to mid-construction phase. | Attend | Lead (CxC) | Attend | Attend | Attend | Attend |
| Equipment Startup Forms | Review / Comment | Review / Comment | Review | Review | Provide / Revise | No Action |
| Write PFCs and FPTs after shop drawings have been reviewed. | Review / Comment | Create/ Update | No Action | Review | Review | Review |
| Develop overall Commissioning Schedule | Review / Assist | Review / Assist | Review | Lead / Document | Review | Review |
| Functional-Performance Tests (FPT) | Observe | Observe / Document | Observe | Schedule | Execute | Execute |

| | | | | | | |
|---|---|---|---|---|---|---|
| Envelope Performance Testing | Observe | Observe / Document | Observe | Schedule | Envelope Performance Testing | No Action |
| Cx Issues Log | Review / Comment | Write / Update | Review | Verify Completion | Correct | Correct |
| Owner Training Sessions | Review | Review / Attend | Review / Attend | Schedule / Execute | Execute | Execute |
| Systems Manual | Review / Comment | Write | Review | Provide info as needed | Provide info as needed | Provide info as needed |
| Opposite Season or Deferred Testing | Observe | Observe / Document | Observe | Schedule | Execute | Execute |
| 10-Month In-Warranty Review | Attend | Lead, Document | Observe | Schedule | Participate | Participate |
| Final Cx Report | Review | Write | Review | No Action | No Action | No Action |

**Table 2. Responsibility Matrix**

## Project Schedule

**Table 3** below sequentially lists the significant Cx tasks for the project. The majority of the schedule information should be provided by the GC. The GC is also responsible for incorporating the Cx effort into the master project schedule so that proper sequencing of effort and adequate time for equipment startup, controls checkout, TAB, PFC completion, and test witnessing can occur. The CxA will assist the CxC in providing estimated test durations based on previous experience. It should be noted that the test durations are highly dependent upon the quality of work and test readiness, which is established by the contractors. CxC will not be pressured to overlook deficiencies or otherwise sacrifice their level of quality assurance to meet the project schedule.

The GC is responsible for keeping the CxA and CxC informed of all scheduling updates and changes. Depending on the Cx scope and the phasing of the project, a more detailed schedule may be required that shows dates for specific equipment.

| Item # | Task | Begin | End |
|---|---|---|---|
| 1 | Cx Kickoff Meeting | TBD | TBD |
| 2 | Equipment installations | TBD | TBD |
| 3 | Equipment startups | TBD | TBD |
| 4 | TAB | TBD | TBD |
| 5 | Contractor completion of CPCs | TBD | TBD |
| 6 | Witnessing FPTs by the CxA | TBD | TBD |
| 7 | Executing envelope performance testing | TBD | TBD |
| 8 | Substantial Completion Date | TBD | TBD |
| 9 | Owner Training by Contractor | TBD | TBD |
| 10 | In-Warranty Review | TBD | TBD |

**Table 3. Cx Schedule Overview**

***For this Project's Schedule**:*

1. The CxC will perform Cx site visits, per the contracted scope, during installation of the equipment and systems.

2. The GC is expected to regularly update the CxA and CxC on project schedule changes and copy the CxA and CxC on all revised project schedule distributions via email.

3. The CxA and CxC will require three weeks' advanced notice prior to the startup of this equipment and functional testing to arrange for travel to the site.

## Project Design Review

The CxA will review the Owner's OPR, the A-E's BOD and the project team's design and construction documents at key milestones throughout the project according to the design schedule set by the owner and A-E. The intent for CxA reviews will be to evaluate whether the design is meeting the OPR and the overall goals of the project. The CxA will submit comments and recommendations to the Owner and A-E for consideration and incorporation into the OPR, BOD and/or the Design Documents.

The A-E is responsible for incorporating the project commissioning requirements into the Bid Documents. This includes the CxA provided Commissioning Specifications.

For each design review performed by CxA on the project, a Design Review Log will be issued to the A-E. Comments or suggestions made by the CxA will be tracked from the first design review through the final design review. Responses from the A-E will also be included as part of the tracking document. The CxA will back check the A-E's responses to the comments in the subsequent design review.

***For this Project Design Reviews:***

1. CxA will review the Owner issued OPR.

2. CxA will review the BOD and the following Design Submissions, as compared to the OPR:
   - 35% Initial Design Documents
   - 65% Interim Design Documents
   - 95% Final Design Document
   - 100% Corrected Final Design / Ready to Advertise documents

## Submittal Review

During the equipment submittal phase, the CxC will review the submittals for equipment included in the Cx scope of work. To best serve the project, the GC shall provide an electronic copy of each submittal to the CxC concurrent with the A-E's review. This will ensure all comments from the CxC can be incorporated in the A-E's response(s). Submittal reviews by the CxC will be focused on the following:

- General conformance to the Owner's project requirements
- Control capability of equipment
- Access requirements
- Maintenance requirements

It is important to note that the responsibility of final submittal approval (or rejection) lies with the A-E. In addition to performing reviews on the submittals, the (approved) submittals will be retained and later may be used by the CxC for the creation of project-specific Equipment Checklists and Functional-Performance Tests.

***For this Project's Cx Submittal Review:***

1. The GC will copy the CxC on submittals for equipment/systems being commissioned.

2. The CxC will review the equipment and material submittals and forward any comments to the A-E.

3. The A-E will incorporate CxC comments as necessary and provide disposition on submittal in final response to GC.

## Cx Kickoff Meeting

A Cx Kickoff Meeting is to be scheduled by the CxC coordinating with the GC early in the construction phase and before equipment that is to be commissioned has arrived on site. This is so the full benefits of the installation verification process can be realized.

At the Cx Kickoff Meeting, attendees shall include members of the Cx Team and representatives from the Contractor, MC, EC, PC, and TAB Contractor. Members from the design team and the Owner are also encouraged to attend. The objective of the meeting is for all parties to achieve an increased understanding of the Cx process. A **Cx Kickoff Meeting Agenda** and **Cx Kickoff Meeting Sign-in Sheet** are provided in Appendix 2 of this document.

A similar meeting shall be facilitated for the building envelope. At the Building Envelope Commissioning Kickoff, required attendees shall include the Air Barrier, Roofing, Exterior Wall System, Glazing Contractors, and any other BERS.

The purpose of the meeting, which is led by the CxC (or BECx), includes the following:

- Share and explain the Cx Plan for the project.
- Help the construction team understand how the forms are used.
- Estimate time frames for events.
- Address any process questions the Cx team members may have.
- Determine the lines of reporting and communication.
- Discuss the preliminary schedule.
- Review the roles and responsibilities of each Cx team member.

The members of the Cx Team are strongly encouraged to ask any questions they may have about the Cx process and their involvement. The CxC will provide meeting minutes (or a Cx Field Report) to capture highlights of the meeting and will distribute to the Cx Team for reference.

## Pre-Functional Construction Checklists

Pre-Functional Construction Checklists (PFCs) are intended to document the quality control process used on the project as it relates to equipment and material installation within the commissioning scope. This process applies to both large and small equipment.

The PFC process is designed to make sure that the following is addressed for each piece of equipment/material:

- Equipment matches the submitted/approved make and model number.
- Material matches the submitted/approved product and manufacturer.
- Equipment/material is not damaged - either when received on site or anytime thereafter.
- Equipment/material is protected while on site prior to installation.
- Equipment/material is installed per the manufacturers' instructions.
- Equipment has all of the accessories required by the construction documents.
- Equipment is started up in accordance with manufacturer's guidelines.
- Control of equipment is as specified.
- Building automation interface is as specified.
- TAB is completed.

Failure in any one of these will result in re-work and extra costs for the installing contractor and potentially will delay the project.

The checklist is of primary importance when determining when the Functional-Performance Test witnessing can begin and when the CxC should arrange to be on-site. Misrepresentation of completed work within the document may result in the responsible contractor getting back-charged for the CxC's time and travel expenses.

PFCs are divided into typical trade divisions – mechanical, electrical, etc. However, it is the CM/GC's responsibility to determine who is responsible for the completion of each checklist item.

Applicable PFCs must be filled out prior to Functional-Performance Testing. To facilitate effective use of the checklists, the CxA suggests that the physical checklist be attached to the equipment in the field. As items are completed, the contractor can check them complete. Electronic copies of PFC's will be available upon request.

The contractors, not the CxC, are ultimately responsible for the PFC documentation and proper checkout of the equipment and are viewed as experts relating to the installed equipment. If the CxC or any other individual makes a recommendation that the contractor feels may cause damage to the equipment, the contractor should inform that party of their concern and only continue with the procedure when they determine it is acceptable. Additionally, if there are checklist items that do not apply for the installation, note as "N/A" and, if not intuitive, provide an explanation on the test form.

Upon completion of the PFC (all trades, with all checklist items filled in and no blanks), the contractor shall notify the CxC, create a pdf of the PFC – either a pdf scan of the hand-written form or electronic printed

pdf of Excel form – and post the pdf to the "Completed PFCs" subfolder in the Contractor Pre-Functional Checklist folder. The CxC will review the completed form(s) and verify that a documented process is being used by reviewing the PFCs in the field. All PFC's are turned into the CxC for project record.
Each piece of equipment within the Cx scope is expected to have a PFC associated with it.

## Equipment Startup Reports

Startup forms are intended to document the process used to prepare a piece of equipment for operation. It is a systematic, logical process whereby equipment is transitioned from its shipping and installation state to full operation according to the manufacturer's specifications. Proper startup is important to make sure the equipment is not damaged at the onset of its use, which could result in any of the following:

- Premature failure
- Inefficient operation whereby wasting energy
- Failure to meet design capacities

The startup of equipment should be done in accordance with the manufacturer's startup procedures and performed only by individuals with sufficient experience and training on the specific equipment. This process applies to both large and small equipment and is targeted at the equipment that is to be commissioned.

Most startup technicians/contractors have equipment-specific startup procedures. A requirement of Cx is to document this quality control process using startup reports (SURs).

The installing contractor is not always the contractor responsible for documenting the startup process. The CM/GC is responsible for determining who is responsible for documenting startup for each piece of equipment.

The contractor responsible for the startup is also responsible for obtaining the manufacturer's startup forms or developing them on their own. The responsible contractor is asked to submit the startup form to the CxC through the CM/GC for each unique piece of equipment prior to commencing the startup process. The contractor, not CxC, is ultimately responsible for the proper startup of the equipment and is viewed as an expert as it relates to this equipment.

The responsible contractor is expected to follow every step on the startup form, sign and date it upon successful completion, and provide the CxC a copy for project record.

Each of the following types of equipment within the Cx scope should have a SUR associated with each unit:

- Equipment supplied with 3-phase power
- Fuel burning equipment
- Direct expansion (DX) equipment

***For this Project's SURs:***

1. ALL proposed startup forms from the installing contractor(s) will be submitted to the CxC for record no less than two weeks prior to use.

2. The CxC will require three weeks' advanced notice prior to the startup of equipment to arrange for travel to the site if necessary.

## Functional-Performance Testing and Witnessing

Systems are typically made up of many separate independent components which must work as stand-alone control loops. An air handling unit is an example of a system that has many independent components – such as control valves, control dampers and sensors – that all must work properly for the whole system to work properly. Functional-Performance Testing is a process that starts at the individual component level and proceeds to the system level.

Verification of the individual components of a system is often referred to as the functional checkout portion of the Functional-Performance Test. The functional checkout tests the individual components of a system to make sure the wiring, set points, and locations are acceptable. Most independent pieces of equipment, such as fan-coil units and exhaust fans, will have functional checks. Examples of functional checks for an air handling unit are:

1) Verifying that the installed temperature sensor is optimally located.

2) Verifying that the sensors are calibrated.

Once the proper operation has been verified for all of the individual components, then, and only then, can all of the components be checked to see if they work together per the sequence of operation. Even though the individual components or pieces of equipment may operate properly, the whole unit/system may not be performing as intended, or the system capacity may not be as high as the design documents imply. This review is typically accomplished by witnessing execution of every line of the sequence of operation. Verification that all of the individual components work together as designed is usually referred to as the performance checkout of the Functional-Performance Test. Examples of performance checks for an air handling unit are:

1) Verifying the cooling and heating modes of operation utilizing local controls.

2) Verifying ventilation system(s) interlocks and sequencing for exhaust/booster fans

3) Verifying the operation and staging for outside air units, reviewing set up and operation of on-board controls.

In addition to verifying the sequence of operation, the performance section also tests to verify that the equipment can achieve design capacities, such as cooling, heating and airflow. This testing is typically done with the TAB contractor.

All Functional-Performance Testing is done with simple pass/fail criteria. If a piece of equipment or system fails any individual step of the Functional-Performance Testing, the CxA may assist the contractors with investigating and solving the deficiency in the spirit of keeping the testing moving forward. Deficiencies that cannot be solved within a reasonable time frame are then noted on the Cx Issues Log, and the test canceled for that piece of equipment until the responsible contractor has corrected the deficiency.

The CxC will create a Functional-Performance Test for each piece of equipment to be commissioned. The tests are then turned over to the CxA for review and comment. The contractor submits the Pre-Functional Checklists along with the **Cx Test Request Form (Appendix A)** to serve as notification that the equipment is complete and ready for FPT witnessing by the CxC. The CxC will witness the proper operation of equipment as the responsible contractor executes the Functional-Performance Test. The CxC will have the contractor's completed pre-requisite documentation and will expect to witness the results documented by the contractor.

The CxC may choose to sample equipment and not witness the testing of each piece of equipment. Refer to the Sampling Section of this plan for the sampling strategy for this project. Regardless of whether the CxC utilizes a sampling strategy, the contractors are responsible for ensuring all equipment and systems operate as intended.

The CxC will schedule, through the GC, witnessing of the Functional-Performance Tests. The contractor is expected to supply the necessary labor, tools, and instruments needed to execute the tests. The contractor shall calibrate all field-installed temperature, relative humidity, CO2 and pressure sensors and gages, and actuators (dampers and valves) on all equipment. Test instruments require a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Procedures used shall be fully documented on the PFT checklists or other suitable forms, along with written calibration documentation of initial, intermediate and final results. The CxC will direct the test, witness the performance, and document the results.

Building enclosure functional performance testing is meant to test the overall building envelope through positive and negative pressure. While performing the pressure test, individual components of the building enclosure and leaks can be tested through a variety of diagnostic methods including thermography and fog.

***For this Project's Functional-Performance Testing**:*

The CxC will provide copies of the proposed FPT's at the Cx Kickoff Meeting for review and discussion.

1. The CxC will revise the FPT's within five business days and provide them to the GC for distribution/use to the subcontractors.
2. The responsible subcontractors will complete the FPT's as part of their checkout process and provide the CxC a copy of the completed test via the CM/GC.

3. Upon receipt of the Cx Test Request Form and associated pre-requisites, the CxC can then, through the GC, schedule on-site Functional-Performance Test witnessing.

## Trade Contractor Testing Support

Aside from the project's basic contract requirements to deliver a fully functional system, some trade contractors have additional responsibilities during Cx testing. The following sub-sections offer further details on the support needed from trade contractors during testing.

**TAB Contractor**

Proper balancing of the equipment and systems is vital to the systems achieving occupant comfort, energy efficiency, and design capacity. For these reasons, validation of the TAB Report is included in the Functional-Performance Testing.

The TAB contractor is expected to submit a copy of the preliminary TAB Report through the CM/GC to the CxC. The CxC will use the report as the primary evaluation criteria, comparing the sampled values to those written in the report. For this reason, the TAB contractor should use the same test equipment and methods previously used when filling in the report data.

The CxC may request TAB to sample any of the following:

1) Verification of airflow at the diffuser level.
2) Verification of terminal unit airflow at maximum and minimum settings.
3) Verification of water flow rate through coils using pressure drop.
4) Verification of registered noise levels within the spaces.
5) Calibration of critical sensors.
6) Verification of flow control devices (balancing valves, dampers, etc.) to verify the systems have been optimized.

**Mechanical, Electrical, and Plumbing Contractors**

Each trade contractor is responsible for the testing of equipment within their trade. Depending on contract requirements, this may include assistance/attendance from manufacturer representatives, equipment vendors, startup technicians, or specialists within the trade contractor's organization. It is the trade contractor's responsibility to have the proper personnel on site with the proper test equipment to perform the outlined test procedures. It is in the best interest of the trade contractor to provide knowledgeable and well-trained personnel to minimize test durations. Typical tasks for the trade contractors and/or their appointed personnel during testing include the following:

- Ensuring no test steps will damage their equipment
- Making corrections/modifications to equipment
- Adjustment of local settings at equipment
- Manipulation of equipment to demonstrate modes of operation
- Diagnosing local equipment notifications/alarms

The trade contractor shall also make the necessary corrections to support the testing by others (such as resetting/replacing electrical breakers, making damper adjustments, adjusting thermostatic mixing valve,

etc.). For this reason, there should be on-site representation of each trade contractor throughout testing to ensure test durations are minimized.

## Sampling Strategy

Not every piece of equipment listed in the Test Manager Matrix as requiring a Functional-Performance Test will be witnessed by the CxC. A sampling strategy will be used on like pieces of non-life safety or non-critical equipment as listed below.

If, during sample witness testing, the failure rate exceeds the defined allowable failure quantity, additional sampling of like units may be required. The contractor responsible for the additional testing may be back charged for the costs associated with the re-testing and/or additional testing. Refer to Table 4 for sampling strategies used for this project.

| Equipment Type | Sample Rate Percent | Sample Quantity | Failure Limit |
|---|---|---|---|
| MECHANICAL SYSTEMS | | | |
| DOAS Units | 100% | N/A | N/A |
| Split System Heat Pumps | 50% | 32 | 2 |
| General Exhaust Fans | 100% | N/A | N/A |
| Toilet Exhaust Fans | 25% | 32 | 2 |
| Dryer Vent Booster Fans | 50% | 32 | 2 |
| Kitchen Hood Fans | 50% | 32 | 2 |
| TAB | | | |
| General Diffusers | 10% | N/A | N/A |
| Air Flow Measuring Stations | 100% | N/A | N/A |
| PLUMBING SYSTEMS | | | |
| Domestic Hot Water System | 50% | 32 | 2 |
| ELECTRICAL SYSTEMS | | | |
| Electrical Distribution System | 100% | N/A | N/A |
| Lighting Controls | 10% | N/A | N/A |
| BUILDING ENVELOPE | | | |
| Storefront / Curtainwall Field Checks (AAMA 501.2) | N/A | N/A | N/A |
| Punched Openings H2O Penetration (ASTM E1105) | N/A | N/A | N/A |
| Roof IR/Nuclear Density Testing (ASTM C1153) | N/A | N/A | N/A |
| Air Tightness Test (ASTM E779) | N/A | N/A | N/A |

**Table 4. Sampling Strategies**

## Observations and Non-Conformance

Throughout the course of the construction and post-construction occupancy phase, the CxA and CxC will be making observations regarding the installation and operation of the commissioned equipment and systems. If the CxA or CxC identifies an item that does not conform to the project documents, the item will be entered into the Cx Issues Log.

The CxA and CxC will update the log after each Cx field visit and submit it to the Owner and GC for review and distribution to the construction team. The GC is responsible for making sure that each issue is addressed by the appropriate contractor and that the log is updated with the date the issue was corrected as well as any notes describing the correction.

The Cx Issues Log does not provide authorization for additional work, change orders, or project extensions. If any item in the log is viewed by a contractor as outside of or in addition to their contracted scope of work, the contractor is requested to respond stating this and seek direction from the Owner. In addition, the Cx Issues Log does not provide authorization for additional work nor is it intended to contradict the contract documents. If any item in the log is viewed by a contractor to contradict the contract documents, the contractor should notify the GC, who will then notify the CxA and CxC of such conflict.

During site observations and test witnessing, it is possible that the CxA or CxC will observe items that can improve the operation or overall performance of the systems in ways not specifically listed in the project specifications. While these suggested enhancements are not deficiencies, the CxA or CxC may list the item in the Cx Issues Log for further discussion with the A-E and/or Owner.

Where problems are found, it is likely that further Functional-Performance Test witnessing will be delayed until all identified issues for that equipment or system have been reported back by the contractors as having been corrected. It is important that the contractors make every attempt to correct all known issues before further testing is to take place. If the CxC returns to the site and determines that a reportedly corrected issue is not corrected, the contractor is at risk of being back-charged for the CxC visit or a portion thereof.

The method of communicating identified issues and their resolution should be discussed and agreed upon at the Cx Kickoff meeting.

A sample of the Cx Issues Log format is shown in the table below.

| No. | Date Logged | Unit Tag / ID# | Issue Description | Date Addressed | Resp. Contr. | Contr. Initials | Correction notes | CxC Initials | Status |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4/1/2020 | AHU-1 | Failed freezestat | 4/8/20 | MC | JJS | Replaced device | RRS | Closed |
| | | | | | | | | | |
| | | | | | | | | | |

**Figure 1. Cx Issues Log format**

**Re-Testing:**

The Contractor shall retest the equipment and systems until all deficiencies have been resolved and provide signatures where applicable on the Cx Issues Log indicating that the deficiencies have been corrected. The CxC will witness retesting at their discretion based on the criticality of the deficiency and time available on site.

The time/cost for the CxC to perform any re-testing will be back-charged to the Division 1 Contractor if either (a) an item was overlooked in the prerequisite documentation or (b) completion of an item was misrepresented in the prerequisite documentation. The Division 1 Contractor may then choose to recover costs from the party responsible for the item.

Re-testing by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Division 1 Contractor. The contractors will be provided with the commissioning test forms in advance to perform the tests as part of their checkout procedures.

## Owner Training

The purpose of training is to give the Owner the best chance of maintaining the high performance, energy efficient building systems turned over to them at substantial completion.

The CxC is responsible for reviewing the content and adequacy of the contractor training provided to the Owner's personnel for the equipment commissioned. The CxC will communicate with the Owner and/or O&M staff to determine what areas and equipment the training should target.

The contractors are responsible for preparing their training plan, submitting it to the CxC for review (at least two weeks prior to the training session), and conducting the training. The GC is responsible for scheduling the training with the Owner.

The training plans should cover the following:

- Equipment discussed.
- Intended audience/participants.
- The location, time and duration of the training sessions.
- Training objectives and methodology of the sessions.
- Training material that will be used (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).
- Instructor qualifications.

Once the training plans have been reviewed and approved the CM/GC should schedule training with the Owner's personnel.

Attendance of various design team members (e.g.: engineer, architect, etc.) is encouraged during training. These members can provide insight as to special features, design considerations, the intent of the design, why certain systems were chosen, how the systems are to interact with other systems, considerations that were made for the future, etc.

***For this Project's Training Sessions**:*

1. The CxC will discuss the Training Plan with the Owner's representative and/or O&M staff to determine if the training covers any special needs and is focused on the topics that are most valuable.

2. The CxC will forward any required enhancements to the Training Plan within 5 business days or the review date.

   It is recommended, although not required, that the Design team share the design intent of the project and how each discipline accomplished this. Participation by the Design team is contingent on their contracted scope of work.

Architect: When applicable, the Architect should provide a general overview of the facility, its use, special features, tenant and public considerations, etc.

Mechanical Design Engineer: The mechanical designer should provide an overview of the major systems and equipment in the facility, including the following for each system:

- Design intent
- Why the system was chosen
- Overview of system operation
- Interactions with other systems
- Miscellaneous issues to be aware of
- Considerations for future expansion and remodeling, etc.

Electrical Design Engineer: The electrical designer should provide an overview of the major electrical systems and equipment in the facility, including the following for each system:

- Design intent
- Why the system was chosen
- Overview of system operation
- Interactions with other systems
- Miscellaneous issues to be aware of
- Considerations for future expansion and remodeling, etc.

## 10-Month Review and Thermal Comfort Survey *(if Required)*

About 10-months after substantial completion, the CxC will conduct a review of the project.

The CxC will visit the site and meet with the Owner's facility staff. The Owner may request all or a selected representative of the contracting tier to be present for all or part of this walk-through.

The meeting is intended for the following:

- To hear firsthand from the facility staff how the building systems are operating.
- To understand what types of warranty calls have surfaced.
- To answer questions the facility staff may have regarding the building systems.

The site walk through commences with a meeting between the CxC, the Owner's representative, and the facility staff to hear how the building systems have operated so far during the warranty period. After the meeting, the CxC will walk through the major mechanical rooms, observe the major pieces of equipment, and view the system from the Building Automation System operator workstation. For the building enclosure, the perimeter and penetrations of the building exterior will be observed.

The outcome of this meeting may result in the following:

- Additional warranty items for the contractors to address.
- A recommendation from the CxC that additional training be provided.

The CxC will provide meeting minutes (or a Cx Field Report) to capture highlights of the meeting and will distribute to the Cx team for reference.

Concurrent with the 10-month review, the Thermal Comfort Survey will occur and will assess the overall satisfaction of the occupants with the thermal comfort of the building spaces. If any occupants are dissatisfied, the survey will provide for follow up questions to identify the nature and cause of the problem. A Final Corrective Action Plan will be issued providing the number of responses for each question and the percent that were dissatisfied for each question and the nature and location of any thermal environmental problems.

## Appendix A – Sample Commissioning Test Request Form

# Sample Commissioning Test Request Form

| | | | |
|---|---|---|---|
| Project Name: | Repair Courtney Tower 4511 Okinawa, Japan | Project #: | *TBD* |
| To: | | Attn: | |
| From: | | | |
| Subject: | Request for on-site test witnessing by CxA personnel | | |
| System(s)/ equipment to be witnessed: | | | |

The Contractor shall email this completed form to the CxA email address listed above along with the associated Contractor Pre-test Checklists (CPC). By forwarding this documentation to the CxA, the Contractor is formally requesting CxA personnel to be on-site to witness the contractor(s) execute the associated Functional-Performance Tests (FPTs). Upon satisfactory completion of the documents, the CxA will schedule the on-site test witnessing effort through the Contractor. The Contractor is responsible for ensuring the proper support personnel are on site to execute the tests as written.

The fundamental requirement for FPT witnessing by the CxA is that the CPC for each piece of equipment is completed with signatures attesting to each readiness activity in the checklist.

The Contractor shall fill in the following and email to the CxA along with any outstanding documentation/ prerequisites to indicate they are ready for witnessing of FPT tests.

| Prerequisite | Completion date (M/D/Y) | Documentation attached (Y/N) * |
|---|---|---|
| Contractor Pre-test Checklist(s) | | |

* *If not attached, indicate date the documentation was provided/posted for CxA review.*

By signing below, the contractor acknowledges liability for the CxA's labor and travel costs if the Functional-Performance Tests cannot be performed due to the contractor's incomplete work and/or misrepresentation within the CPC documentation.

| | |
|---|---|
| | |
| printed name | company |
| | |
| signature | date |

## Appendix B – Sample Commissioning Kickoff Meeting Agenda and Sign-In Sheet

### Commissioning – Kickoff Meeting Agenda

| | | | |
|---|---|---|---|
| Project Name: | Repair Courtney Tower 4511<br>Okinawa, Japan | Project #: | *TBD* |
| Attendees: | CM/GC<br>Mechanical Contractor<br>Electrical Contractor | Plumbing Contractor<br>TAB Sub-contractor | |
| Cx Provider: | *TBD* | | |

1. Introductions (fill in the Sign-in Sheet), attendees Cx experience, lines of communication
2. Review of the Commissioning Plan
    a. Overview
    b. Project Description / Cx Scope
    c. Roles and Responsibilities (circulate table for completion)
    d. Project Schedule
    e. Submittal Review
    f. Contractor Pre-Functional Checklists (PFC)
    g. Equipment Startup Reports
    h. Functional-Performance Testing
        i. Contractor review and acceptance of Functional-Performance Tests
        ii. Requirements prior to starting (Startup Reports, PFCs, Cx Test Request Form)
        iii. Tentative schedule and sequence of events
    i. Trade Contractor Support
        i. Test, Adjust and Balance (TAB)
            1. Required prior to Functional-Performance Witness testing
            2. Document submission(s)
            3. Validation process of TAB report
        ii. MEP support
    j. FPT Sampling Strategy
    k. Testing Approach
    l. Observations and Non-Conformance
        i. Issue Log items – deficiencies and enhancement opportunities
        ii. Log maintenance/updates/resolutions
    m. Close-out Document review
    n. Owner Training
    o. 10-Month Review
3. Cx Field Reports
    a. Frequency, Distribution, Attachments

# Commissioning Meeting Sign-in Sheet

| | | | |
|---|---|---|---|
| Date: | *TBD* | Project #: | *TBD* |
| Project Name: | Repair Courtney Tower 4511<br>Okinawa, Japan | | |
| Location of Meeting: | *TBD* | | |

| Participant | Company | E-mail | Telephone |
|---|---|---|---|
| | | | |
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## FUNCTIONAL-PERFORMANCE TEST

| | | |
|---|---|---|
| **Project Name / Number:** | | |
| **Test completed by:** | | |
| **Equipment Type / Description:** | DX 100%OA CV WHEEL GAS | |
| **Equipment Tag:** | DOAS | |
| **Document Identification #:** | FPT DOAS | |
| **Date of Test:** | | |

| **Point Verification** | **Point** | | Initial BMS Data | **PASS (Y/N)** |
|---|---|---|---|---|
| The purpose of this step is to verify all required control points are displayed with normal values and correct units. ***Note: Points listed may be communicated through integration of the unit controller.*** | | *Integration* | | |
| | INT | OA Damper | | |
| | | OA Damper ES | | |
| | | OA Temp ( wheel ent) | | |
| | | OA RH (wheel ent) | | |
| | | OA Filter DP | | |
| | | Wheel S/S | | |
| | | Wheel Speed | | |
| | | Wheel Fdbk | | |
| | | Wheel Fault | | |
| | | Cooling Coil temp | | |
| | | HG ReHeat Temp | | |
| | | Gas Heat enable | | |
| | | Gas Heat Mod Valve % | | |
| | | Pre Heat Temp (ent) | | |
| | | Pre Heat Temp (lvg) | | |
| | | SF S/S | | |
| | | SF Status | | |
| | | High Static Safety | | |
| | | Freeze Safety | | |
| | | DX Cool Stages | | |
| | | HG ReHeat Mod Valve | | |

| **Sensor Accuracy** | **Sensor** | Optimum Location (Y/N) | Handheld Reading | Final Sensor Reading | **PASS (Y/N)** |
|---|---|---|---|---|---|
| The purpose of this step is to field verify each of the listed monitored inputs is located in the optimum sensing location and to sample accuracy using a calibrated handheld device. | OA Temp ( wheel ent) | | | | |
| | OA RH (wheel ent) | | | | |
| | Cooling Coil temp | | | | |
| | HG ReHeat Temp | | | | |
| | Pre Heat Temp (ent) | | | | |
| | Pre Heat Temp (lvg) | | | | |
| | High Static Safety | | | | |
| | Freeze Safety | | | | |
| | | | | | |

**FUNCTIONAL-PERFORMANCE TEST**

| | | |
|---|---|---|
| **Document Identification #:** | FPT DOAS | |
| **Date of Test:** | | |

| **Trending** | **Point** | | **PASS (Y/N)** |
|---|---|---|---|
| The purpose of this step is to verify trended data points are available at the BAS. | | OA Temp ( wheel ent) | |
| | | OA RH (wheel ent) | |
| | | Cooling Coil temp | |
| | | HG ReHeat Temp | |
| | | Pre Heat Temp (ent) | |
| | | Pre Heat Temp (lvg) | |
| | | DX Cooling Stages | |
| | | Gas Heat Status | |

| **Cooling Mode** | **Sub-steps** | | Value | **PASS (Y/N)** |
|---|---|---|---|---|
| The purpose of this Step is to verify cooling operation during high and low cooling demand. | 1 | *OCCUPIED Mode, adjust variables to initiate Cooling Mode: (OA Temp > EA Temp AND Space Temp > Space Temp Setpoint)* | | |
| | | Record current OA Temp | | |
| | | Record calculated Dewpoint Temp | | |
| | | Record SA Temp Setpoint | | |
| *If OA DewPoint is less 50F the Wheel is OFF* | | Enthalpy Wheel energized | | |
| | | Record Wheel OA entering Temp | | |
| | | Record React OA entering Temp | | |
| | | Record React OA leaving Temp | | |
| | | Cooling stages energized to maintain CC Temp Setpoint | | |
| *CCT Setpoint = 52F ~ 55F* | | Cooling output % | | |
| *SAT Setpoint = 70F* | | SA Temp Setpoint maintained | | |
| | | Active cooling stages cycle off as CC LA Temp approaches 45F | | |
| | | Cooling Mode operation stable | | |
| | | Return all adjusted variables to AUTO | | |

| **Heating Mode** | **Sub-steps** | | Value | **PASS (Y/N)** |
|---|---|---|---|---|
| The purpose of this Step is to verify gas heat is functional. | 1 | *Heat is enabled if: OA temp < SA Temp Setpoint* ***AND*** *DeHum Mode is OFF,* ***OR*** *if SA cannot be maintained ~ 70F* | | |
| | | SA temperature setpoint | | |
| | | Compressors OFF | | |
| | | Compressors OFF | | |
| | | Heating demand (%) *(expect 100%)* | | |
| | | Modulating gas valve stable | | |
| | | Gas heat entering air temperature | | |
| | | Gas heat leaving air temperature | | |
| | | Heating delta T at/near design | | |
| | 2 | *Return SA setpoint to initial/normal value, and verify heating output is reduced.* | | |
| | | Heating demand reduced | | |
| | | Modulating gas valve stable | | |
| | | SA temperature maintained at setpoint | | |
| | | | | |

**FUNCTIONAL-PERFORMANCE TEST**

| | | |
|---|---|---|
| **Document Identification #:** | FPT DOAS | |
| **Date of Test:** | | |

| **Dehumification Mode** | **Sub-steps** | | Value | **PASS (Y/N)** |
|---|---|---|---|---|
| The purpose of this Step is to verify Wheel operation and DX modulating hot gas reheat is functional. | 1 | *DeHum Mode is active if the following are true: OA Dewpoint > SA Dewpoint* ***OR*** *Wheel leaving Dewpoint > SAT Dewpoint* | | |
| | | Adjust variables as needed to initiate Wheel operation | | |
| | | If the OA Enthalpy is greater than the RA enthalpy then the Wheel is ON and Wheel speed modulates to 100%. | | |
| | | Wheel starts at min speed | | |
| | | Wheel speed increases as expected, document wheel speed after stabilization | | |
| | | SA temperature setpoint remains unchanged | | |
| | | DX Cooling stages maintain CC Temp setpoint | | |
| | | Hot gas reheat enabled | | |
| | | Hot gas reheat valve modulates to maintain SAT at setpoint | | |
| | | Wheel operation stable | | |
| | | Hot Gas valve modulation stable | | |
| | | DX Compressor(s) operation stable | | |
| | | Return all adjusted variables to AUTO | | |
| **Alarms** | **Sub-steps** | | Threshold HI / LO | **PASS (Y/N)** |
| Verify the following alarms are set up at the BAS and displayed on the graphics | 1 | OA Temp ( wheel ent) | | |
| | | OA RH (wheel ent) | | |
| | | Cooling Coil temp | | |
| | | HG ReHeat Temp | | |
| | | Pre Heat Temp (ent) | | |
| | | Pre Heat Temp (lvg) | | |
| | | DX Compressor (stages) | | |
| | | SF Failure | | |
| | | React Fan Failure | | |

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## PRE-FUNCTIOAL CONTRACTORS CHECKLIST

| | | |
|---|---|---|
| **Project Name / Number:** | | |
| **Checklist completed by:** | | |
| **Equipment Type / Description:** | Dedicated Outside Air System - SF/EF/Wheel | |
| **Equipment Tag:** | DOAS xx | |
| **Document Identification #:** | PFCC | |
| **Date Submitted:** | | |

*To complete the checklist, the responsible contractor shall fill in each line item, check the boxes to indicate "Complete", fill in his/her initials under "Initial", and fill in the date the item was verified under "Date". Incomplete or deficient items should be noted within the "Notes" section found at the end of the checklist.*

| **Pre-Installation / Model Verification** | | | | | | |
|---|---|---|---|---|---|---|
| | Submitted/Approved | | | Delivered/Installed | | |
| Manufacturer | | | | | | |
| Model Number | | | | | | |
| Serial Number | | | | | | |
| Supply Airflow (CFM) | | | | | | |
| Supply Fan - Voltage / Phase / HP | | | | | | |
| Exhaust Airflow (CFM) | | | | | | |
| Exhaust Fan - Voltage / Phase / HP | | | | | | |
| Enthalpy Wheel RPM | | | | | | |
| Enthalpy - Voltage / Phase / HP | | | | | | |
| Equipment is free of damage upon receiving? | | | | | | Y / N |

| **Installation** | | | |
|---|---|---|---|
| ***General*** | Complete | Initial | Date |
| Unit ID tags and labelling | | | |
| Factory installation and start-up documents available | | | |
| Access doors / latches operable | | | |
| Adequate clearance for maintenance | | | |
| Unit secured per specifications | | | |
| Modular component sections sealed airtight | | | |
| Construction filters / media in place | | | |
| Final filters in place | | | |
| Filter pull area free of obstructions | | | |
| Housekeeping pad completed as specified. | | | |
| Unit installed level | | | |
| ***Supply Fan*** | Complete | Initial | Date |
| Belts tensioned properly / fan spins free - no obstructions. | | | |
| Bushings and set screws tight | | | |
| Fan hub tight on shaft / Keyways in place | | | |
| Shipping bolts removed | | | |
| Vibration isolation loaded | | | |
| ***Exhaust Fan*** | Complete | Initial | Date |
| Belts tensioned properly / fan spins free - no obstructions. | | | |
| Bushings and set screws tight | | | |
| Fan hub tight on shaft / Keyways in place | | | |
| Shipping bolts removed | | | |
| Vibration isolation loaded | | | |
| ***Enthalpy Wheel*** | Complete | Initial | Date |
| Placement and installation items removed, including shipping brackets | | | |

**PRE-FUNCTIOAL CONTRACTORS CHECKLIST**

| | | |
|---|---|---|
| **Document Identification #:** | PFCC | |
| **Date Submitted:** | | |

| | | | |
|---|---|---|---|
| Brush seals adjusted, should maintain light contact with rotor, | | | |
| Rotor shaft bearings properly greased | | | |
| Wheel is rotating the correct direction | | | |
| ***Ductwork*** | Complete | Initial | Date |
| All dampers and sensors accessible to Cx Authority and TAB | | | |
| Control dampers operate freely w/ no binding | | | |
| Duct pressure test performed as required | | | |
| Flexible canvas connectors installed | | | |
| Ductwork insulation complete | | | |
| Duct smoke detectors installed (where required) | | | |
| Duct access doors installed | | | |
| Fire/smoke dampers installed, powered open | | | |
| Duct supports and stiffeners per SMACNA | | | |
| Turning vanes installed per specifications | | | |
| ***Electrical*** | Complete | Initial | Date |
| SF VFD / Disconnect in place per NEC / AHJ | | | |
| EF VFD / Disconnect in place per NEC / AHJ | | | |
| High voltage wiring in place per NEC / AHJ | | | |
| Wiring ampacity adequate for supply voltage | | | |
| Flexible conduit used for final connections to motor | | | |
| Grounding in place per NEC | | | |
| Overload protection correct size/installed | | | |
| High voltage wiriing is free of abrasions, kinks, and sharp corners | | | |
| Low voltage circuits isolated from high voltage control and power circuits | | | |
| Electrical connections torqued | | | |
| Low and high voltage compartments separated | | | |
| Motor connections verified (high / low) | | | |
| Control conduit and cabling in place / terminated | | | |
| Control sensors, switches, transmitters, and relays installed/terminated | | | |
| Control interlocks complete and functional | | | |
| Control system point-to-point verification completed | | | |
| Fire Alarm interlock complete | | | |

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**08/22**

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# SECTION 02 41 00

# DEMOLITION
**08/22**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

| | |
|---|---|
| ASSP A10.6 | (2006) Safety & Health Program Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations |

CARPET AND RUG INSTITUTE (CRI)

| | |
|---|---|
| CRI 104 | (2015) Carpet Installation Standard for Commercial Carpet |
| CRI 105 | (2015) Carpet Installation Standard for Residential Carpet |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 40 CFR 61 | National Emission Standards for Hazardous Air Pollutants |

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

| | |
|---|---|
| FAA AC 70/7460-1 | (2016; Rev L; Change 2) Obstruction Marking and Lighting |

### 1.2 PROJECT DESCRIPTION

#### 1.2.1 Definitions

##### 1.2.1.1 Demolition

Demolition is the process of tearing apart and removing any feature of a facility together with any related handling and disposal operations.

##### 1.2.1.2 Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

#### 1.2.1.3 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

#### 1.2.1.4 Deconstruction Plan

Deconstruction Plan is the planned steps and processes for dismantling all or portions of a structure or assembly, to include managing sequencing activities, storage, re-installation activities, salvage and disposal mechanisms.

### 1.2.2 Demolition Plan

Prepare a Demolition Plan and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan must be approved by Contracting Officer prior to work beginning.

### 1.2.3 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the building.The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

## 1.3 ITEMS TO REMAIN IN PLACE

Comply with FAR 52.236-9 to protect existing vegetation, structures, equipment, utilities, and improvements. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements and pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

### 1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

### 1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

### 1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 1.8 m high fence. Erect and secure fence a minimum of 1.5 m from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

### 1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

### 1.3.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

## 1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

## 1.5 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available at contract award.

## 1.6 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan; G

Existing Conditions

SD-07 Certificates

Notification; G

## 1.7 QUALITY ASSURANCE

Submit timely notification of demolition and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSP A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

### 1.7.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, flooding, or pollution. Vacuum and dust the work area daily.

## 1.8 PROTECTION

### 1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind, jet or prop blast. Notify the Contracting Officer prior to beginning such work.

Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over 30 m, but less than 60 m above ground level. The use of LED based obstruction lights are not permitted. For temporary structures (including cranes) over 60 m above ground level provide obstruction lighting in accordance with FAA AC 70/7460-1. Perform light construction and installation in compliance with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

### 1.8.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the site specific features structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

## 1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

## 1.10 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer or the Contracting Officer's Representative showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs or electronic images with a minimum resolution of 3072 x 2304 pixels, capable of a print resolution of 300 dpi, will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results to the Contracting Officer or the Contracting Officer's Representative.

# PART 2 PRODUCTS

## 2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.

b. Provide fill material conforming to the definition of satisfactory soil material as defined in Section 31 00 00 EARTHWORK. In addition, fill material must be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 50 mm in any dimension.

# PART 3 EXECUTION

## 3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Disassemble

existing construction scheduled to be removed for reuse. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Designate materials for reuse onsite whenever possible.

### 3.1.1 Structures

a. Remove existing structures indicated to be removed to grade. Remove interior walls, other than retaining walls and partitions, to top of concrete slab on ground. Break up basement slabs to permit drainage. Remove sidewalks, curbs, gutters and street light bases as indicated.

b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections.

c. Locate demolition and deconstruction equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

### 3.1.2 Utilities and Related Equipment

#### 3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

#### 3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location on the station in accordance with instructions of the Contracting Officer.

### 3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs as indicated. Provide neat sawcuts at limits of pavement removal as indicated. Remove pavement and slabs not to be used in this project from the project site at Contractor's expense.

### 3.1.4 Roofing

Salvage roofing materials. Sequence work to minimize building exposure between demolition or deconstruction and new roof materials installation.

#### 3.1.4.1 Temporary Roofing

Install temporary roofing and flashing as necessary to maintain a

watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials unless approved otherwise by the Contracting Officer.

### 3.1.5 Concrete

Saw concrete along straight lines to a depth of a minimum 50 mm. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete. Sawcuts in existing concrete sidewalk, roads, concrete pads, parking areas, must be at the nearest existing expansion joint or weakened plane joint and at full depth.

### 3.1.6 Miscellaneous Metal

Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

### 3.1.7 Carpentry

Salvage for recycle lumber, millwork items, and finished boards, and sort by type and size. Recycle salvaged wood unfit for reuse, except stained, painted, or treated wood.

### 3.1.8 Carpet

Remove existing carpet for reclamation in accordance with manufacturer recommendations and as follows. Remove used carpet in large pieces, roll tightly, and pack neatly in a container. Remove adhesive according to recommendations of the Carpet and Rug Institute (CRI). Provide adhesive removal solvents in compliance with CRI 104/CRI 105. Recycle removed carpet cushion.

### 3.1.9 Acoustic Ceiling Tile

Remove, neatly stack, and recycle acoustic ceiling tiles. Recycling may be available with manufacturer. Otherwise, give priority to a local recycling organization. Recycling is not required if the tiles contain or may have been exposed to asbestos material.

### 3.1.10 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Make finished surfaces of patched area flush with the adjacent existing surface and match the existing adjacent surface as closely as possible to texture and finish. Provide patching as specified and indicated, and include the following:

a. Concrete and Masonry: Completely fill holes and depressions, caused by

previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.

c. Patch acoustic lay-in ceiling where partitions have been removed. Make the transition between the different ceiling heights by continuing the higher ceiling level over to the first runner on the lower ceiling and closing the vertical opening with a painted sheet metal strip.

3.1.11 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990.

3.1.12 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.13 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

3.1.14 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated on station storage area as directed by the Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse; provide to recycling service for disassembly and recycling of parts.

3.1.14.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; drain tanks, piping and fixtures; if previously used to store flammable, explosive, or other dangerous liquids, steam clean interiors. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.14.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, attach end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve to the open end of the pipe to ensure positive leak

control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.14.3 Ducts

Classify removed duct work as scrap metal.

3.1.14.4 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify non-porcelain broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor.

3.1.15 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.15.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.15.2 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

3.1.15.3 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.15.4 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and

disposed.

## 3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

## 3.3 DISPOSITION OF MATERIAL

### 3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, become the property of the Contractor and must be removed from Government property. Materials approved for storage by the Contracting Officer must be removed before completion of the contract. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

## 3.4 CLEANUP

Remove debris and rubbish from project site and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

## 3.5 DISPOSAL OF REMOVED MATERIALS

### 3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan. Storage of removed materials on the project site is prohibited.

### 3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

### 3.5.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

### 3.5.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil per Section 01 57 19.01 TEMPORARY ENVIRONMENTAL CONTROLS.

## 3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

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ASBESTOS REMEDIATION

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ASBESTOS REMEDIATION
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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

| | |
|---|---|
| ASSE/SAFE Z9.2 | (2012) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM D4397 | (2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications |
| ASTM E1368 | (2014) Visual Inspection of Asbestos Abatement Projects |

COMPRESSED GAS ASSOCIATION (CGA)

| | |
|---|---|
| CGA G-7 | (2014) Compressed Air for Human Respiration; 6th Edition |

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

| | |
|---|---|
| ANSI/ISEA Z87.1 | (2015) Occupational and Educational Personal Eye and Face Protection Devices |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 701 | (2019) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films |

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

| | |
|---|---|
| NIOSH NMAM | (2016; 5th Ed) NIOSH Manual of Analytical Methods |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| JEGS | (April 2024) Japan Environmental Governing Standards |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910.147 | The Control of Hazardous Energy (Lock Out/Tag Out) |
| 29 CFR 1926.103 | Respiratory Protection |
| 29 CFR 1926.1101 | Asbestos |
| 29 CFR 1926.200 | Accident Prevention Signs and Tags |
| 29 CFR 1926.51 | Sanitation |
| 29 CFR 1926.59 | Hazard Communication |
| 40 CFR 61-SUBPART A | General Provisions |
| 40 CFR 61-SUBPART M | National Emission Standard for Asbestos |
| 40 CFR 763 | Asbestos |
| 42 CFR 84 | Approval of Respiratory Protective Devices |
| 49 CFR 107 | Hazardous Materials Program Procedures |
| 49 CFR 171 | General Information, Regulations, and Definitions |
| 49 CFR 172 | Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements |
| 49 CFR 173 | Shippers - General Requirements for Shipments and Packagings |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 586 | (2009; Reprint Sep 2022) UL Standard for Safety High-Efficiency Particulate, Air Filter Units |

## 1.2 DEFINITIONS

### 1.2.1 ACM

Asbestos Containing Materials.

### 1.2.2 Amended Water

Water containing a wetting agent or surfactant with a maximum surface

tension of 2.9 Pa.

1.2.3 Area Sampling

Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.2.4 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content of the material is determined to be at least one tenth of one percent.

1.2.4.1 Asbestos-Containing Material (ACM)

Any materials containing more than one tenth of one percent (0.1%) asbestos.

1.2.5 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

1.2.6 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.2.7 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

1.2.8 Authorized Person

Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

1.2.9 Background

The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

1.2.10 Building Inspector

Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, has EPA/State certification/license as a "Building Inspector".

1.2.11 Competent Person (CP)

A person meeting the requirements for competent person as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan ( 40 CFR 763) for contractor/supervisor, and is AHERA certified as a contractor/supervisor.

1.2.12 Contractor

The Contractor is that individual, or entity under contract to perform the herein listed work.

1.2.13 Class I Asbestos Work

Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.

1.2.14 Class II Asbestos Work

Activities defined by OSHA involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos - containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements when they are still intact are excluded from Class II asbestos work. Removal of small amounts of these materials which would fit into a glovebag may be classified as a Class III job.

1.2.15 Class III Asbestos Work

Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above the ceiling, where asbestos is actively disturbed or asbestos-containing debris is actively disturbed.

1.2.16 Class IV Asbestos Work

Maintenance and custodial construction activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.

1.2.17 Contractor/Supervisor

Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; and is AHERA certified as a "Contractor/Supervisor".

1.2.18 Disposal Bag

A 0.15 mm thick, leak-tight plastic bag, pre-labeled in accordance with

29 CFR 1926.1101, used for transporting asbestos waste from containment to disposal site.

1.2.19 Disturbance

Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in one standard sized glovebag or waste bag, not larger than 1.5 m in length and width in order to access a building component.

1.2.20 Encapsulation

The abatement of an asbestos hazard through the appropriate use of chemical encapsulants.

1.2.21 Encapsulants

Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

a. Removal Encapsulant (can be used as a wetting agent)

b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)

c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage)

d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

1.2.22 Friable Asbestos Material

A term defined in the JEGS meaning any material which contains more than 0.1 percent asbestos, as determined using the method specified in the JEGS, that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

1.2.23 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101 utilizing a bag not more than 1.5 by 1.5 m impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.

1.2.24 Government Consultant (GC)

That qualified person employed directly by the Government to monitor, sample, inspect the work or in some other way advise the Contracting Officer. The GC is normally a private consultant, but can be an employee of the Government.

1.2.25 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters must retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.2.26 Industrial Hygienist (IH)/Private Qualified Person (PQP)

A registered Architect, Professional Engineer (licensed), or U.S. Certified Industrial Hygienist who has successfully completed training in, and is accredited under a legitimate Model Accreditation Plan, as described in 40 CFR 763, as a certified Building Inspector, Contractor/Supervisor, and Project Designer. The IH/PQP shall have working knowledge of applicable U.S. Federal and Japanese occupational safety and health regulations for asbestos in construction.

The IH/PQP shall be considered a competent person as defined in 29 CFR 1926.1101. The IH/PQP shall be a third party Contractor and have no employee/employer relationship or financial relationship with the abatement Contractor, which could constitute a conflict of interest.

1.2.27 Industrial Hygiene Technician

The Industrial Hygiene Technician (IHT) shall be an employee of the IH/PQP or the testing laboratory, have a minimum of 2 years experience in the industrial hygiene field working under the direction of the IH/PQP, and have completed the following courses: "Contractor Supervisor Abatement Worker".

1.2.28 Model Accreditation Plan (MAP)

USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.

1.2.29 Negative Initial Exposure Assessment

A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).

1.2.30 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

1.2.31 NESHAP

National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61-SUBPART M.

1.2.32 Nonfriable Asbestos Material

A term defined in the JEGS meaning a material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

1.2.33 Permissible Exposure Limits (PELs)

1.2.33.1 PEL-Time Weighted Average(TWA)

Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8-hour time weighted average (TWA).

1.2.33.2 PEL-Excursion Limit

An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes.

1.2.34 Personal Sampling

Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

1.2.35 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.36 Qualified Person (QP)

A Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or other qualified person who has successfully completed training and is therefore accredited under a legitimate Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Project Designer. The QP must be qualified to perform visual inspections as indicated in ASTM E1368.

1.2.37 Regulated Asbestos Containing Material

Friable asbestos material; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding grinding, cutting, or abrading; or Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

1.2.38 TEM

Refers to Transmission Electron Microscopy.

1.2.39 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

1.2.40 Transite

A generic name for asbestos cement wallboard and pipe.

1.2.41 Wetting Agent

A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is

applied. An equivalent wetting agent must have a surface tension of at most 2.9 Pa.

1.2.42 Worker

Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation, if required by the OSHA Class of work to be performed.

1.3 REQUIREMENTS

1.3.1 Description of Work

The work covered by this section includes the handling and control of asbestos containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos containing materials generated by the work. More specific operational procedures must be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification. The asbestos work includes the demolition and removal of the interior window caulking, covebase adhesive and white wall pipe penetration located throughout the building. Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein and/or developed by the IH/PQP and pre-approved by the Government. Provide techniques as outlined in this specification. The work area will be evacuated during the asbestos abatement work. A competent person must supervise asbestos removal work as specified herein.

1.3.1.1 Wallboard/Joint Compound

Discrete samples of the components (wallboard and joint compound) have been tested and results are shown in the attached Hazardous Material Survey.

1.3.2 Unexpected Discovery of Asbestos

The Contractor shall be responsible to review the available asbestos survey reports for this project, including, but not limited to: Inspection Report for Asbestos, Lead-Based Paint, Chromium, Cadmium, PCBs, and Miscellaneous Hazardous Materials Repair Courtney Tower 4511 Camp Courtney, Okinawa Japan by EnviroQuest Inc., dated June 2023.

The Contractor's IH/PQP shall review the existing asbestos survey report(s) to develop the appropriate work response to ACM which may be disturbed as part of this project. Should the contract require the Contractor to perform any hazardous material survey, the Contractor shall provide a copy of all surveys/sampling activities and analytical results regarding asbestos to the Contracting Officer. The Asbestos Abatement Contractor shall also submit an Asbestos Hazard Abatement Plan, reviewed and certified by the IH/PQP, to the Contracting Officer for review before asbestos abatement work begins.

The Contractor shall review the existing Hazardous Material Reports and familiarize themselves on the specific homogeneous materials that were tested and all materials that were determined to be ACM. The Contractor shall be responsible for visually confirming the presence of these materials. The Contractor shall remove ACM which would otherwise be disturbed during normal work practices to execute the work required by this project:

The Contractor shall notify the Contracting Officer if any previously untested building components suspected to contain asbestos are discovered and will be impacted by the work. The material(s) in question shall not be disturbed until a response is received by the Contracting Officer. For any previously untested building components suspected to contain asbestos and located in areas impacted by the work, notify the Contracting Officer (CO) who will order up to 20 bulk samples to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM. The laboratory shall have a working definition of “Trace” amounts of asbestos, and the laboratory shall report any detectable amount of asbestos in a bulk sample that is less than the PLM Limit of Quantification of 1% as a “Trace” concentration. If PLM does not detect the presence of asbestos (e.g. “non-detect”), the material shall be considered <0.1% asbestos. If PLM analysis detects asbestos in any discernible amount (to include “trace” or “less than 1%”), the material shall be considered >0.1% asbestos unless proven to be non-ACM by the use of quantification methods capable of achieving an analytical sensitivity of less than 0.1%, such as Transmission Electron Microscopy (TEM) or 1000 point counting. The CO will order up to 4 samples to be analyzed further by TEM or 1000 point counting. Any additional components identified as ACM that have been approved by the CO for removal shall be removed and will be paid for by an equitable adjustment to the contract price under the CONTRACT CLAUSE titled "changes". Sampling shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course and is EPA/State certified/licensed as a "Building Inspector".

### 1.3.3 Medical Requirements

Provide medical requirements including but not limited to medical surveillance and medical record keeping as listed in 29 CFR 1926.1101.

#### 1.3.3.1 Medical Examinations

Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 or other pertinent local, prefectural or Government of Japan (GOJ) directives. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination must be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

#### 1.3.3.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of 30 years after

termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

### 1.3.4 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with 40 CFR 763; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis. Organize certificates by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 40 CFR 763. Train personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria. Document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the Contracting Officer. Furnish each employee with respirator training and fit testing administered by the PQP as required by 29 CFR 1926.1101 and 29 CFR 1926.103. Fully cover engineering and other hazard control techniques and procedures.

### 1.3.5 Permits, Licenses, and Notifications

Prior to the start of work, obtain necessary permits in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by local, prefectural and GOG regulations. Notify the Contracting Officer in writing 20 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M and applicable laws, ordinances, criteria, rules, and regulations. In accordance with the JEGS, prior to demolition or renovation of a facility that involves removing or disturbing friable ACM, a written assessment of the action will be prepared and submitted to the installation commander via the Contracting Officer. Submit copies of all Notifications to the Contracting Officer.

### 1.3.6 Environment, Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of local prefectural and GOJ regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of EM 385-1-1, 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, and 40 CFR 763. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Government apply.

### 1.3.7 Respirator Fit Testing

The Contractor's PQP must conduct a qualitative or quantitative fit test conforming to 29 CFR 1926.103 for each worker required to wear a respirator, and any authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test must be performed prior to initially wearing a respirator and every 12 months thereafter. If physical changes develop that will affect the fit, a new fit test must be performed. Functional fit checks must be performed each time a respirator is put on and in accordance with the manufacturer's recommendation.

### 1.3.8 Respirator Selection and Use Requirements

Provide respirators, and ensure that they are used as required by 29 CFR 1926.1101 and in accordance with CGA G-7 and the manufacturer's recommendations. Respirators must be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. For air-purifying respirators, the particulate filter must be high-efficiency particulate air (HEPA)/(N-,R-,P-100). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type must be made by the Contractor's Qualified Person based on the measured or anticipated airborne asbestos fiber concentrations to be encountered.

### 1.3.9 Asbestos Hazard Control Supervisor

The Contractor must be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

### 1.3.10 Hazard Communication

Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Safety Data Sheets (SDS) for all materials brought to the site.

### 1.3.11 Asbestos Hazard Abatement Plan

Submit a detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the removal and demolition of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, must be prepared, signed, and sealed by the PQP. Provide a Table of Contents for each abatement submittal, which follows the sequence of requirements in the contract. The plan must include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan must also include (both fire and medical emergency) response plans and an Activity Hazard Analyses (AHAs) in accordance with EM 385-1-1. The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos

work. The Contractor, Asbestos Hazard Control Supervisor, CP and PQP must meet with the Contracting Officer prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan must be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.12 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory successfully participates in the AIHA Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm must be independent of the asbestos contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.3.13 Landfill Approval

Submit written evidence that the landfill is approved for asbestos disposal by local prefectural and GOJ regulatory agencies. Within three working days after delivery, submit detailed delivery tickets, prepared, signed, and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill. Submit a copy of the waste shipment records within one day of the shipment leaving the project site.

1.3.13.1 Records

The Contractor shall maintain records of all waste sampling and test data. The data shall include results of analyses performed, sample locations, the time of collection, and other pertinent data as applicable during the life of the contract. Transportation, treatment, and disposal methods and dates; quantities of wastes; names and addresses of each transporter and the dispsoal or reclamation facility, shall also be recorded and made available for inspection, along with the following documents:

1. Asbestos Waste Shipment Records
2. Waste Analyses
3. Licenses
4. Permits
5. Scale Weight Measurements
6. Weight Bills and Delivery Tickets

1.3.14 Transporter Certification

Submit written evidence that the transporter is approved to transport asbestos waste in accordance with the DOT requirements of 49 CFR 171, 49 CFR 172 and 49 CFR 173 as well as registration requirements of 49 CFR 107 and all other GOJ and local prefectural regulatory agency requirements.

### 1.3.15 Medical Certification

Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CFR 1926.103 as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

## 1.4 SUBMITTALS

The Contractor's PQP shall, at a minimum, review and certify all submittals required under this section prior to submission to the Government. Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Amended Water; G

Safety Data Sheets (SDS) for All Materials; G

Respirators; G

Local Exhaust Equipment; G

Pressure Differential Automatic Recording Instrument; G

Vacuums; G

Glovebags; G

SD-06 Test Reports

Air Sampling Results; G

Pressure Differential Recordings for Local Exhaust System; G

Clearance Sampling; G

Asbestos Disposal Quantity Report; G

SD-07 Certificates

Employee Training; G

Notifications; G

Asbestos Hazard Abatement Plan; G

Testing Laboratory; G

Landfill Approval; G

Delivery Tickets; G

Waste Shipment Records; G

Transporter Certification; G

Medical Certification; G

Private Qualified Person Documentation; G

Competent Person; G

Worker's License; G

Contractor's License; G

Equipment Used to Contain Airborne Asbestos Fibers; G

Vacuums; G

Ventilation Systems;G

SD-11 Closeout Submittals

Permits; G

Notifications; G

Records

## 1.5 QUALITY ASSURANCE

### 1.5.1 Additional Requirements

In addition to detailed requirements of this specification, work performed under this contract shall comply with the JEGS, EM 385-1-1, applicable federal, GOJ, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply. The following GOJ and local laws, rules and regulations regarding demolition, removal, encapsulation, construction alteration, repair, maintenance, renovation, spill/emergency cleanup, housekeeping, handling, storing, transporting and disposing of asbestos material apply:

Japan Environmental Governing Standards (JEGS), most recent version .

### 1.5.2 Private Qualified Person Documentation

Submit the name, address, telephone number, and resume of the Private Qualified Person (PQP) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, direct air monitoring and assist the Contractor's Competent Person in implementing and ensuring that safety and health requirements are complied with during the performance of all required work, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and

Project Designer. as described by 40 CFR 763. The PQP and the asbestos contractor must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP must be a first tier subcontractor. The Designated IH/PQP shall be onsite at all times for the duration of asbestos activities and shall be available for emergencies. In addition, submit resumes of additional IH/PQP's and industrial hygiene technicians (IHT) who will be assisting the Designated IH/PQP in performing onsite tasks. IH/PQPs and IHTs supporting the Designated IH/PQP shall have a minimum of 2 years of practical onsite asbestos abatement experience. Indicate the formal reporting relationship between the Designated IH/PQP and the support IH/PQPs and IHTs, the Designated Competent Person, and the Contractor.

### 1.5.3 Competent Person Documentation

The Competent Person must be experienced in the administration and supervision of asbestos abatement projects including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite. The Competent Person must be on-site at all times when asbestos abatement activities are underway. Submit training certification and a current EPA MAP "Contractor/Supervisor" training certificates.. Submit evidence that the Competent Person has a minimum of 2 years of comprehensive experience in planning and overseeing asbestos abatement activities and is experienced in the administration and supervision of asbestos abatement projects relevant to OSHA competent person requirements, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The Designated Competent Person shall be responsible for compliance with the JEGS, applicable U.S. federal, GOJ, and local requirements, the Contractor's Accident Prevention Plan (APP) and Asbestos Hazard Abatement Plan (AHAP).

### 1.5.4 Worker's License

Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M and other applicable federal, GOJ, and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment". Training documentation is required for each employee who will perform OSHA Class I, Class II, Class III, or Class IV asbestos abatement operations. Such documentation shall be submitted on a Contractor generated form titled "Certificate of Workers Acknowledgment", to be completed for each employee in the same format. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.

### 1.5.5 Contractor's License

Submit a copy of the asbestos contractor's AHERA Asbestos Worker(s) certification. Submit the following certification along with the license:

"I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926.1101, 40 CFR 61-SUBPART MEM 385-1-1, and the Federal, JEGS, GOJ and local prefecture requirement for those asbestos abatement activities that they will be involved in." This certification statement must be signed by the Company's President or Chief Executive.

### 1.5.6 Air Sampling Results

Complete fiber counting and provide results to the PQP for review within 48 hours of the "time off" of the sample pump. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees where required by law within three working days, signed by the testing laboratory. Notify the Contractor and the Contracting Officer immediately of any results in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance must levels exceed 0.1 fibers per cubic centimeter.

### 1.5.7 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.51 mm of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day to the PQP and GC for review and to the Contracting Officer within 24-hours from the end of each work day. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher.

### 1.5.8 Preconstruction Conference

Conduct a safety preconstruction conference to discuss the details of the Asbestos Hazard Abatement Plan reviewed and certified by the Contractor's PQP, Accident Prevention Plan (APP) including the AHAs required in specification Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The safety preconstruction conference must include the Contractor and their Designated Competent Person, Qualified Person and Project Supervisor and the Contracting Officer. Deficiencies in the APP will be discussed. Onsite work must not begin until the APP has been accepted.

## 1.6 SECURITY

A log book must be kept documenting entry into and out of the regulated area. Entry into regulated areas must only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas must be trained, medically evaluated, and wear the required personal protective equipment.

# PART 2 PRODUCTS

## 2.1 DUCT TAPE

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

## 2.2 DISPOSAL CONTAINERS

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers must be provided for ACM wastes as required by 29 CFR 1926.1101. Disposal containers can be in the form of:

a. Disposal Bags

b. Fiberboard Drums

c. Cardboard Boxes

## 2.3 SHEET PLASTIC

Sheet plastic must be polyethylene of 0.15 mm minimum thickness and must be provided in the largest sheet size necessary to minimize seams. Film must conform to ASTM D4397, except as specified below

### 2.3.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets must be provided. Film must conform to the requirements of NFPA 701.

### 2.3.2 Reinforced

Reinforced sheets must be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock must consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film must meet flame resistant standards of NFPA 701.

## 2.4 MASTIC REMOVING SOLVENT

Mastic removing solvent must be nonflammable and must not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite must have a flash point greater than 60 degrees C.

## 2.5 LEAK-TIGHT WRAPPING

Two layers of 0.15 mm minimum thick polyethylene sheet stock must be used for the containment of removed asbestos-containing components or materials such as large tanks, boilers, insulated pipe segments and other materials. Upon placement of the ACM component or material, each layer must be individually leak-tight sealed with duct tape.

## 2.6 VIEWING INSPECTION WINDOW

Where feasible, a minimum of one clear, 3 mm thick, acrylic sheet,450 by 610 mm, must be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows must be sealed leak-tight with industrial grade duct tape.

## 2.7 WETTING AGENTS

Removal encapsulant (a penetrating encapsulant) must be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant must be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by

amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS above.

# PART 3 EXECUTION

## 3.1 EQUIPMENT

Provide the Contracting Officer or the Contracting Officer's Representative, with at least two complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

### 3.1.1 Air Monitoring Equipment

The Contractor's PQP must approve air monitoring equipment. The equipment must include, but must not be limited to:

a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute.

b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps must also be equipped with an automatic flow control unit which must maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.

c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal air sampling.

### 3.1.2 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

#### 3.1.2.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, encapsulation removal and or demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103.

### 3.1.3 Exterior Whole Body Protection

#### 3.1.3.1 Outer Protective Clothing

The use of reusable whole body outer protective clothing is prohibited from use. Provide personnel exposed to asbestos with disposable whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but must not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

#### 3.1.3.2 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51 (f) (4) (ii) through (V) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. HEPA vacuum and remove asbestos contaminated reusable protective clothing while still wearing respirators at the boundary of the asbestos work area, seal in two impermeable bags, label outer bag as asbestos contaminated waste, and transport for decontamination. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Wastewater filters must be installed in series with the first stage pore size 20 microns and the second stage pore size of 5 microns. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste. Keep the floor of the decontamination unit's clean room dry and clean at all times. Proper housekeeping and hygiene requirements must be maintained. Provide soap and towels for showering, washing and drying. Cloth towels provided must be disposed of as ACM waste or must be laundered in accordance with 29 CFR 1926.1101. Physically attach the decontamination units to the asbestos control area. Construct both a personnel decontamination unit and an equipment decontamination unit onto and integrate with each asbestos control area.

#### 3.1.3.3 Eye Protection

Provide eye protection that complies with ANSI/ISEA Z87.1 when operations present a potential eye injury hazard. Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

### 3.1.4 Regulated Areas

All Class I, II, and III asbestos work must be conducted within regulated areas. The regulated area must be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

### 3.1.5 Load-out Unit

Provide a temporary load-out unit that is adjacent and connected to the regulated area. Attach the load-out unit in a leak-tight manner to each regulated area.

### 3.1.6 Warning Signs and Labels

Provide bilingual warning signs printed in English and Japanese at all

approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to the requirements are acceptable

3.1.6.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200, and 29 CFR 1926.1101 minimum 500 by 355 mm displaying the following legend in the lower panel:

| Legend | Notation |
|---|---|
| DANGER | 25 mm Sans Serif Gothic or Block |
| ASBESTOS | 25 mm Sans Serif Gothic or Block |
| MAY CAUSE CANCER | 25 mm Sans Serif Gothic or Block |
| CAUSES DAMAGE TO LUNGS | 6 mm Sans Serif Gothic or Block |
| AUTHORIZED PERSONNEL ONLY | 6 mm Sans Serif Gothic or Block |
| WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA | 6 mm Sans Serif Gothic or Block |

Spacing between lines must be at least equal to the height of the upper of any two lines.

3.1.6.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

| |
|---|
| DANGER |
| CONTAINS ASBESTOS FIBERS |
| MAY CAUSE CANCER |
| CAUSES DAMAGE TO LUNGS |
| DO NOT BREATHE DUST AVOID CREATING DUST |

3.1.7 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ASSE/SAFE Z9.2 and 29 CFR 1926.1101 that will provide at least four

air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the asbestos control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.51 mm of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment must conform to ASSE/SAFE Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

### 3.1.8 Tools

Vacuums must be leak proof to the filter and equipped with HEPA filters. Filters on vacuums must conform to ASSE/SAFE Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse. Reusable tools must be thoroughly decontaminated prior to being removed from the regulated areas.

### 3.1.9 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

### 3.1.10 Glovebags

Submit written manufacturers proof that glovebags will not break down under expected temperatures and conditions. The glovebag assembly shall be 0.15 mm thick plastic, prefabricated and seamless at the bottom with preprinted OSHA warning label.

### 3.1.11 Single Stage Decontamination Area

A decontamination area (equipment room/area) must be provided for Class I work involving less than 7.5 m or 0.9 square meters of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment. The equipment room or area must be adjacent to the regulated area for the decontamination of employees, material, and their equipment which could be contaminated with asbestos. The area must be covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area.

### 3.1.12 Decontamination Area Exit Procedures

Ensure that the following procedures are followed:

a. Before leaving the regulated area, remove all gross contamination and debris from work clothing using a HEPA vacuum.

b. Employees must remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers for

disposal or laundering.

c. Employees must not remove their respirators until showering.

d. Employees must shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

## 3.2 WORK PROCEDURE

Perform asbestos related work in accordance with the JEGS, 29 CFR 1926.1101, and as specified herein. Use wet removal procedures and negative pressure enclosure techniques. Wear and utilize protective clothing and equipment as specified herein. No eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics is permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal and demolition of asbestos containing material must not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Seal all roof top penetrations, except plumbing vents, prior to asbestos roofing work. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system prior to the commencement of asbestos work. Power to the regulated area must be locked-out and tagged in accordance with 29 CFR 1910.147. Disconnect electrical service when wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water. All electrical work must be performed by a licensed electrician. Stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Correct the condition to the satisfaction of the PQP , including visual inspection and air sampling. Work must resume only upon notification by the Contracting Officer once the PQP has certified that the condition has been corrected. Corrective actions must be documented. If an asbestos fiber release or spill occurs, stop work immediately, correct the condition to the satisfaction of the PQP. Submit the documents certified by the PQP to the Contracting Officer including clearance sampling,and obtain the Contracting Officer's approval prior to resumption of work.

### 3.2.1 Building Ventilation System and Critical Barriers

Building ventilation system supply and return air ducts in a regulated area must be shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910.147 isolated by airtight seals to prevent the spread of contamination throughout the system. The airtight seals must consist of air-tight rigid covers for building ventilation supply and exhaust grills where the ventilation system is required to remain in service during abatement. Edges to wall, ceiling and floor surfaces must be sealed with industrial grade duct tape.

a. A Competent Person must supervise the work.

b. For indoor work, critical barriers must be placed over all openings to the regulated area.

c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

### 3.2.2 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the PQP work may proceed at the discretion of the Contracting Officer.

### 3.2.3 Furnishings

Furniture and equipment will remain in the building. Cover and seal furnishings with 0.15 mm plastic sheet or remove from the work area and store in a location on site approved by the Contracting Officer.

### 3.2.4 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

### 3.2.5 Asbestos Control Area Requirements

Removal of asbestos containing materials may require the use of a negative pressure enclosure. Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos negative pressure enclosure with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Negative pressure enclosure development must include protective covering of uncontaminated walls, and ceilings with a continuous membrane of two layers of minimum 0.15 mm plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 0.15 mm plastic sheet over floors and extend a minimum of 300 mm up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings will be allowed in enclosures of asbestos control areas for personnel and equipment entry and exit, the supply and exhaust of air for the local exhaust system and the removal of properly containerized asbestos containing materials. Replace local exhaust system filters as required to maintain the efficiency of the system.

#### 3.2.5.1 Glovebag

If the construction of a negative pressure enclosure is infeasible for the removal of gray pipe penetration wall sealant located in the above ceiling plenum areas. Use alternate techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas. The PQP must conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and

other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those obtained by the Contractor, the Government will determine which results predominate. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

#### 3.2.5.2 Regulated Area for Class II Removal

Removal of asbestos containing covebase mastic, gray pipe penetration wall sealant and window caulking are Class II removal activities. Establish designated limits for the asbestos regulated work area with the use of red barrier tape; install critical barriers, splash guards and signs, and maintain all other requirements for asbestos control area except local exhaust. Place impermeable dropcloths on surfaces beneath removal activity extending out 3 feet in all directions. A detached decontamination system may be used. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If workers the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

### 3.2.6 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 0.15 mm plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 0.15 mm plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Containerize asbestos containing material while wet. Do not allow asbestos material to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

#### 3.2.6.1 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as venetian blinds, full-height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit, panels, and other contaminated items designated for removal by completely coating the items with an asbestos lock-down encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lock-down encapsulant must be tinted a contrasting color and spray-applied by airless method. Thoroughness of sealing operation must be visually gauged by the extent of colored coating on exposed surfaces. Lock-down encapsulants must comply with the

performance requirements specified herein.

3.2.7 Methods of Compliance

3.2.7.1 Mandated Practices

The specific abatement techniques and items identified must be detailed in the Contractor's AHAP. Use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

a. Vacuum cleaners equipped with HEPA filters.

b. Wet methods or wetting agents except where it can be demonstrated that the use of wet methods is unfeasible due to the creation of electrical hazards, equipment malfunction, and in roofing.

c. Prompt clean-up and disposal.

d. Inspection and repair of polyethylene.

e. Cleaning of equipment and surfaces of containers prior to removing them from the equipment room or area.

3.2.7.2 Control Methods

Use the following control methods:

a. Local exhaust ventilation equipped with HEPA filter;

b. Enclosure or isolation of processes producing asbestos dust;

c. Where the feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PELs, use them to reduce employee exposure to the lowest levels attainable and must supplement them by the use of respiratory protection.

3.2.7.3 Unacceptable Practices

The following work practices must not be used:

a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.

b. Compressed air used to remove asbestos containing materials, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

c. Dry sweeping, shoveling, or other dry clean up.

d. Employee rotation as a means of reducing employee exposure to asbestos.

3.2.8 Specific Control Methods for Class I Work

3.2.8.1 Negative Pressure Enclosure (NPE) System

The system must provide at least four air changes per hour inside the containment. The local exhaust unit equipment must be operated 24-hours per day until the containment is removed. The NPE must be smoke tested

for leaks at the beginning of each shift and be sufficient to maintain a minimum pressure differential of minus 0.5 mm of water column relative to adjacent, unsealed areas. Pressure differential must be monitored continuously, 24-hours per day, with an automatic manometric recording instrument and Records must be provided daily on the same day collected to the Contracting Officer. The Contracting Officer must be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system must not be used as the local exhaust system for the regulated area. The NPE must terminate outdoors unless an alternate arrangement is allowed by the Contracting Officer. All filters used must be new at the beginning of the project and must be periodically changed as necessary and disposed of as ACM waste.

3.2.8.2 Glovebag Systems

Glovebags must be used without modification, smoke-tested for leaks, and completely cover the circumference of pipe or other structures where the work is to be done. Glovebags must be used only once and must not be moved. Glovebags must not be used on surfaces that have temperatures exceeding 66 degrees C. Prior to disposal, glovebags must be collapsed using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation must be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least two persons must perform glovebag removal. Asbestos regulated work areas must be established for glovebag abatement. Designated boundary limits for the asbestos work must be established with rope or other continuous barriers and all other requirements for asbestos control areas must be maintained, including area signage and boundary warning tape.

a. Attach HEPA vacuum systems to the bag to prevent collapse during removal of ACM.

b. The negative pressure glove boxes must be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure must be created in the system using a HEPA filtration system. The box must be smoke tested for leaks prior to each use.

3.2.8.3 Mini-Enclosure

Mini-containment (small walk-in enclosure) to accommodate no more than two persons, may be used if the disturbance or removal can be completely contained by the enclosure. The mini-enclosure must be inspected for leaks and smoke tested before each use. Air movement must be directed away from the employee's breathing zone within the mini-enclosure.

3.2.9 Class II Work Procedures

In addition to the requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

a. A Competent Person must supervise the work.

b. For indoor work, critical barriers must be placed over all openings to the regulated area.

c. Impermeable dropcloths must be placed on surfaces beneath all removal

activity.

3.2.10 Specific Control Methods for Class II Work

3.2.10.1 Sealants and Mastic

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers and signs, and maintain all other requirements for asbestos control area except local exhaust. Spread 0.15 mm plastic sheeting on the ground around the perimeter of the work area extending out in all directions. Using adequately wet methods, carefully remove the ACM sealants and mastics using a scraper of knife blade. As it is removed place the material into a disposal bag. Make every effort to keep the asbestos material from falling to the ground or work area floor below. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter and disposable dust bag. Place debris into a 0.15 mm minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to remove any visible contamination and place into a second 0.15 mm minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or at designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.11 Air Sampling

Perform sampling of airborne concentrations of asbestos fibers in accordance with 29 CFR 1926.1101, the Contractor's air monitoring plan and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 must be performed by the PQP. Sampling performed for environmental and quality control reasons must be performed by the PQP. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate. Results of breathing zone samples must be posted at the job site and made available to the Contracting Officer. Submit all documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

3.2.11.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each demolition and removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.11.2 Sampling During Asbestos Work

The PQP must provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Breathing zone

samples must be taken for at least 25 percent of the workers in each shift, or a minimum of two, whichever is greater. Air sample fiber counting must be completed and results provided within 48-hours (breathing zone samples), and 48 hours (environmental/clearance monitoring) after completion of a sampling period. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. The written results must be signed by testing laboratory analyst. The air sampling results must be documented on a Contractor's daily air monitoring log.

3.2.11.3 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH NMAM Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, must be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) must be confirmed from that same filter using NIOSH NMAM Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning must be repeated at the Contractor's expense. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.11.4 Sampling After Final Clean-Up (Clearance Sampling)

The Contractor must perform any Clearance Sampling utilizing a third-party independent person who has no ties to the Contractor (except as being a subcontractor), the Asbestos Abatement Subcontractor, and the IH/PQP for the project. Provide area sampling of asbestos fibers and establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP must perform a visual inspection in accordance with ASTM E1368 to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Prepare a written report signed and dated by the PQP documenting that the asbestos control area is free of dust, dirt, and debris and all waste has been removed. Perform at least 2 samples. The asbestos fiber counts from these samples must be less than 0.01 fibers per cubic centimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value take appropriate actions to re-clean the area and repeat the sampling and analysis at the Contractor's expense.

3.2.11.5 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

### 3.2.12 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP must conduct a visual inspection of all areas affected by the removal in accordance with ASTM E1368. Inspect for any visible fibers.

### 3.2.13 Site Inspection

While performing asbestos engineering control work, the Contractor must be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation must be at the Contractor's expense.

## 3.3 CLEAN-UP AND DISPOSAL

### 3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor must re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer must agree that the area is safe in writing before unrestricted entry will be permitted. The Government must have the option to perform monitoring to determine if the areas are safe before entry is permitted.

### 3.3.2 Title to Materials

All waste materials, except as specified otherwise, become the property of the Contractor and must be disposed of as specified in accordance with the JEGS, applicable U.S. Federal, GOJ, and local regulations. The Contractor shall be licensed to both transport and to dispose of asbestos waste in accordance with the JEGS and the Japanese Waste Law. Copies of these licenses shall be provided to the Contracting Officer.

### 3.3.3 Disposal of Asbestos

#### 3.3.3.1 Procedure for Disposal

Coordinate all waste disposal manifests with the Contracting Officer.

Collect asbestos waste, contaminated waste water filters, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g. double plastic bags 0.15 mm thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with JEGS section 5.5 Asbestos Disposal. Affix a warning label to each container including the bags or use at least 0.15 mm thick bags with the approved warnings preprinted on the bag. Clearly indicate on the outside of each container the name of the waste generator and the location at which the waste was generated. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Comply with JEGS section 5.5 Asbestos Disposal, GOJ, regional, and local standards for hauling and disposal. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags must remain in the drum and the entire contaminated drum must be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums must wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

#### 3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear meters or square meters as described initially in this specification and in cubic meters for the amount of asbestos containing material released for disposal.

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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

| | |
|---|---|
| ASSE/SAFE Z9.2 | (2012) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E1613 | (2012) Standard Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques |
| ASTM E1728 | (2016) Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 701 | (2019) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| JEGS | (April 2024) Japan Environmental Governing Standards |

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

| | |
|---|---|
| HUD 6780 | (1995; Errata Aug 1996;Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1926.103 | Respiratory Protection |

| | |
|---|---|
| 29 CFR 1926.1126 | Chromium |
| 29 CFR 1926.1127 | Cadmium |
| 29 CFR 1926.21 | Safety Training and Education |
| 29 CFR 1926.33 | Access to Employee Exposure and Medical Records |
| 29 CFR 1926.55 | Gases, Vapors, Fumes, Dusts, and Mists |
| 29 CFR 1926.59 | Hazard Communication |
| 29 CFR 1926.62 | Lead |
| 29 CFR 1926.65 | Hazardous Waste Operations and Emergency Response |
| 40 CFR 260 | Hazardous Waste Management System: General |
| 40 CFR 261 | Identification and Listing of Hazardous Waste |
| 40 CFR 262 | Standards Applicable to Generators of Hazardous Waste |
| 40 CFR 263 | Standards Applicable to Transporters of Hazardous Waste |
| 40 CFR 264 | Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 265 | Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities |
| 40 CFR 268 | Land Disposal Restrictions |
| 40 CFR 745 | Lead-Based Paint Poisoning Prevention in Certain Residential Structures |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 586 | (2009; Reprint Sep 2022) UL Standard for Safety High-Efficiency Particulate, Air Filter Units |

## 1.2 DEFINITIONS

### 1.2.1 Abatement

Measures defined in 40 CFR 745, Section 223, designed to permanently eliminate lead-based paint hazards.

### 1.2.2 Action Level

Employee exposure, without regard to use of respirators, to an airborne

concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period; to an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air averaged over an 8-hour period; to an airborne concentration of chromium (VI) of 2.5 micrograms per cubic meter of air averaged over an 8-hour period.

1.2.3 Area Sampling

Sampling of lead, cadmium, chromium concentrations within the lead, cadmium, chromium control area and inside the physical boundaries which is representative of the airborne lead, cadmium, chromium concentrations but is not collected in the breathing zone of personnel (approximately 1.5 to 1.8 meters above the floor).

1.2.4 Cadmium Permissible Exposure Limit (PEL)

Five micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.1127. If an employee is exposed for more than 8-hours in a work day, determine the PEL by the following formula:

PEL (micrograms/cubic meter of air) = 40/No. hrs worked per day

1.2.5 Child-Occupied Facility

Real property which is a building or portion of a building constructed prior to 1978 visited regularly by the same child, six-years of age or under, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3-hours, and the combined annual visits last at least 60-hours. Child-occupied facilities include but are not limited to, day-care centers, preschools and kindergarten classrooms.

1.2.6 Chromium Permissible Exposure Limit (PEL)

Five micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.1126. If an employee is exposed for more than 8-hours in a work day, determine the PEL by the following formula:

PEL (micrograms/cubic meter of air) = 40/No. hrs worked per day

1.2.7 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead, cadmium and chromium hazards in accordance with current U.S. federal, GOJ national, prefectural, and local regulations and has the authority to take prompt corrective actions to control the lead, cadmium and chromium hazard. The Contractor may provide more than one CP as required to supervise and monitor the work. The CP must be a Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals or a licensed lead-based paint abatement Supervisor/Project Designer.

1.2.8 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

1.2.9 Decontamination Shower Facility

That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

1.2.10 Deleading

Activities conducted by a person who offers to eliminate lead-based paint or lead-based paint hazards or paints containing cadmium/chromium or to plan such activities in commercial buildings, bridges or other structures.

1.2.11 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead, cadmium, chromium to which an employee is exposed, averaged over an 8-hour workday as indicated in 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

1.2.12 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead, cadmium, chromium contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

1.2.13 Industrial Hygienist/Private Qualified Person (IH/PQP)

The IH/PQP shall have demonstratable experience in lead air monitoring techniques and in the establishment of a respiratory protection program for employees. The IH/PQP shall have working knowledge of applicable Federal and Japanese regulations occupational safety and health regulations for lead in construction. The IH/PQP shall have attended and completed Lead Abatement Supervision and Monitoring training and shall be considered a competent person as defined in 29 CFR 1926.62. The IH/PQP shall be a registered Architect, Professional Engineer, Certified Industrial Hygienist who has successfully completed training and is therefore accredited under a legitimate Model Accreditation Plan. The IH/PQP must be qualified to perform visual inspections.

1.2.14 Industrial Hygiene Technician (IHT)

The Industrial Hygiene Technician (IHT) shall be an employee of the IH/PQP or the testing laboratory and shall have a minimum of 2 years experience in the industrial hygiene field working under the direction of the IH/PQP and has completed the following course: Lead Abatement Supervision and Monitoring - Covering practices and procedures in lead abatement, lead air sampling and abatement monitoring.

1.2.15 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds. The use of the term Lead in this section also refers to paints which contain detectable concentrations of Cadmium and Chromium. For the purposes of the section lead-based paint (LBP) and paint with lead (PWL) also contains cadmium and chromium.

1.2.16 Lead-Based Paint (LBP)

Paint or other surface coating that contains lead in excess of 1.0

milligrams per centimeter squared or 0.5 percent by weight.

1.2.17 Lead-Based Paint Activities

In the case of target housing or child occupied facilities, lead-based paint activities include; a lead-based paint inspection, a risk assessment, or abatement of lead-based paint hazards.

1.2.18 Lead-Based Paint Hazards

Paint-lead hazard, dust-lead hazard or soil-lead hazard as identified in 40 CFR 745, Section 65. Any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, lead-based paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.

1.2.18.1 Lead Containing Paint

Paint or other surface coating that contains lead in excess of 0.009 percent by weight (90 PPM) and up to 0.5 percent by weight (5,000 ppm).

1.2.19 Lead, Cadmium, Chromium Control Area

A system of control methods to prevent the spread of lead, cadmium, chromium dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

1.2.20 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8-hours in a work day, determine the PEL by the following formula:

PEL (micrograms/cubic meter of air) = 400/No. hrs worked per day

1.2.21 Material Containing Lead/Paint with Lead (MCL/PWL)

Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01 percent). An X-Ray Fluorescence (XRF) instrument is not considered a valid test method.

1.2.22 Personal Sampling

Sampling of airborne lead, cadmium, chromium concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Samples must be representative of the employees' work tasks. Breathing zone must be considered an area within a hemisphere, forward of the shoulders, with a radius of 150 to 225 mm and centered at the nose or mouth of an employee.

1.2.23 Physical Boundary

Area physically roped or partitioned off around lead, cadmium, chromium control area to limit unauthorized entry of personnel.

1.2.24 Target Housing

Residential real property which is housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any one or more children age 6-years or under resides or is expected to reside in such housing for the elderly or persons with disabilities) or any zero bedroom dwelling.

1.3 DESCRIPTION

Construction activities impacting PWL or material containing lead, cadmium, chromium which are covered by this specification include the demolition or removal of material containing lead, cadmium, chromium in intact condition, located throughout the building as identified in the inspection report and as indicated on the drawings. The work covered by this section includes work tasks and the precautions specified in this section for the protection of building occupants and the environment during and after the performance of the hazard abatement activities.

The Contractor shall assume that all coatings will contain some level of lead, cadmium, and Chromium. The Contractor shall review existing Lead Paint survey data.

1.3.1 Protection of Existing Areas To Remain

Project work including, but not limited to, lead, cadmium, chromium hazard abatement work, storage, transportation, and disposal must be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, restore work and areas to the original condition.

1.3.2 Coordination with Other Work

Coordinate with work being performed in adjacent areas to ensure there are no exposure issues. Explain coordination procedures in the Lead, Cadmium, Chromium Compliance Plan and describe how the Contractor will prevent lead, cadmium and chromium exposure to other contractors and Government personnel performing work unrelated to lead, cadmium and chromium activities.

1.3.3 Sampling and Analysis

Submit a log of the analytical results from sampling conducted during the abatement. Keep the log of results current in the Environmental Records Binder and brief the results to the Contracting Officer as analytical results are reported.

1.3.3.1 Dust Wipe Materials, Sampling and Analysis

Sampling must conform to ASTM E1728. Analysis must conform to ASTM E1613.

1.3.3.2 Clearance Monitoring

a. Collect dust wipe samples inside the lead, cadmium and chromium hazard

control area after the final visual inspection in the quantities and at the locations specified in accordance with HUD.

1.3.4 Clearance Requirements

Target housing and child occupied facilities clearance levels.

(1) Floors 10.
(2) Interior Window Sills 100.
(3) Window Troughs 400.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Occupational and Environmental Assessment Data Report; G

Medical Examinations; G

Lead, Cadmium, Chromium Waste Management Plan; G

Licenses, Permits and Notifications; G

Initial Sample Results; G

Lead, Cadmium, Chromium Compliance Plan; G

SD-03 Product Data

Respirators; G

Vacuum Filters; G

Negative Air Pressure System; G

Materials and Equipment; G

Expendable Supplies; G

SD-06 Test Reports

Occupational and Environmental Assessment Data Report; G

Sampling Results; G

SD-07 Certificates

Clearance Certification; G

SD-11 Closeout Submittals

Hazardous Waste Manifest; G

## 1.5 QUALITY ASSURANCE

### 1.5.1 Qualifications

#### 1.5.1.1 Competent Person (CP)

Include in the Lead, Cadmium, Chromium Compliance plan, the name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph COMPETENT PERSON (CP) RESPONSIBILITIES. Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62), Chromium standard ( 29 CFR 1926.1126), Cadmium standard (29 CFR 1926.1127) which shows ability to assess occupational and environmental exposure to lead, cadmium, chromium; experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Demonstrate a minimum of 3 years experience implementing OSHA's Lead in Construction standard (29 CFR 1926.62), Chromium standard ( 29 CFR 1926.1126), and Cadmium standard (29 CFR 1926.1127). Submit proper documentation that the CP is trained and certified in accordance with U.S. federal and local laws. The competent person must be a trained and certified lead-based paint abatement Supervisor/Project Designer.

#### 1.5.1.2 Training Certification

Include in the Lead, Cadmium, Chromium Compliance plan, a certificate for each worker and supervisor, signed and dated by the accredited training provider, stating that the employee has received the required lead, cadmium and chromium training specified in 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 40 CFR 745 and is certified to perform or supervise deleading, lead removal or demolition activities.

#### 1.5.1.3 Testing Laboratory

Include in the Lead, Cadmium, Chromium Compliance plan, the name, address, and telephone number of the testing laboratory selected to perform the air and wipe analysis, testing, and reporting of airborne concentrations of lead, cadmium and chromium. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis.

#### 1.5.1.4 Third Party Consultant Qualifications

Include in the Lead, Cadmium, Chromium Compliance plan, the name, address and telephone number of the third party consultant selected to perform the wipe sampling for determining concentrations of lead, cadmium and chromium in dust. Submit proper documentation that the consultant is trained and certified as an inspector technician or inspector or risk assessor by the USEPA authorized certification and accreditation program.

### 1.5.2 Requirements

#### 1.5.2.1 Competent Person (CP) Responsibilities

a. Verify training meets all U.S. federal, GOJ national, prefectural, and

local requirements.

b. Review and approve Lead, Cadmium, Chromium Compliance Plan for conformance to the applicable referenced standards.

c. Continuously inspect LBP/PWL or MCL work for conformance with the approved plan.

d. Perform (or oversee performance of) air sampling. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.

e. Ensure work is performed in strict accordance with specifications at all times.

f. Control work to prevent hazardous exposure to human beings and to the environment at all times.

g. Supervise final cleaning of the lead, cadmium, chromium control area, take clearance wipe samples if necessary; review clearance sample results and make recommendations for further cleaning.

h. Certify the conditions of the work as called for elsewhere in this specification.

i. The CP must be certified pursuant to 40 CFR 745, Section 226 and is responsible for development and implementation of the occupant protection plan, the abatement report and supervise lead, cadmium and chromium hazard abatement work activities.

1.5.2.2 Lead, Cadmium, Chromium Compliance Plan

The purpose of the plan for this project is to verify that the Contractor understands that they will encounter paint with lead (PWL), cadmium and Chromium. All painted surfaces scheduled for disturbance have been tested. The Contractor shall notify the Contracting Officer if any previously untested painted surfaces are discovered and will be impacted by the work. The material(s) in question shall not be disturbed until a response is received by the Contracting Officer. For any previously untested painted surfaces suspected to contain lead, cadmium and chromium and located in areas impacted by the work, notify the Contracting Officer who will order up to 10 paint samples to be obtained at the contractor's expense and delivered to a laboratory accredited for lead analysis under the American Industrial Hygiene Association Environmental Lead Laboratory Accreditation Program. The Contractor's LCCCP shall identify the Contractor's process to comply with all applicable regulations depending on the method of work the Contractor choose when encountering paints and coatings.

The Lead, Cadmium, Chromium Compliance Plan shall be reviewed and approved (with signature, date of approval, and certification number) by the IH/PQP.

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of lead, cadmium and chromium, LBP/PWL or MCL. Include in the plan a sketch showing the location, size, and details of lead, cadmium, chromium control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls and job responsibilities for each

activity from which lead, cadmium, chromium is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead, cadmium, chromium related work, collected waste water and dust containing lead, cadmium, chromium and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead, cadmium, chromium is not released outside of the lead, cadmium, chromium control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and to clarify responsibilities to control exposures.

The plan shall also include the requirements of paragraphs 1.5.1.1 through 1.5.1.4.

The plan must be developed and signed by the IH/PQP. The plan must include the name, certificate, and certification number of the person signing the plan.

1.5.2.3 Occupational and Environmental Assessment Data Report

If initial monitoring is necessary, submit occupational and environmental sampling results to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

a. The initial monitoring must represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62,29 CFR 1926.1126, 29 CFR 1926.1127. The data must represent the worker's regular daily exposure to lead, cadmium, chromium for stated work.

b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead, cadmium and chromium containing coatings are present.

c. The initial assessment must determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead, cadmium, chromium compliance plan per 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

1.5.2.4 Medical Examinations

Submit pre-work blood lead levels and post-work blood lead levels for all workers performing lead, cadmium, chromium activities during the execution of the work. Initial medical surveillance as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 must be made available to all employees exposed to lead, cadmium, chromium at any time (one day) above the action level. Full medical surveillance must be made available to all employees on an annual basis who are or may be exposed to lead, cadmium and chromium

in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Adequate records must show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead, cadmium, chromium as indicated in 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.5 Training

Train each employee performing work that disturbs lead, cadmium, chromium, who performs LBP/MCL/PWL disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127, 40 CFR 745 and GOJ and local regulations where appropriate.

1.5.2.6 Respiratory Protection Program

a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

b. Establish and implement a respiratory protection program as required by 29 CFR 1926.103, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 29 CFR 1926.55.

1.5.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.5.2.8 Lead, Cadmium, Chromium Waste Management

The Lead, Cadmium, Chromium Waste Management Plan must comply with applicable requirements of the JEGS. U.S federal, GOJ National, prefectural, and local hazardous waste regulations and address:

a. Identification and classification of wastes associated with the work.

b. Estimated quantities of wastes to be generated and disposed of.

c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact. Furnish two copies of local hazardous waste permits.

d. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

e. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Clean up and containerize wastes daily.

f. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.

g. Unit cost for hazardous waste disposal according to this plan.

1.5.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of the JEGS, U.S. federal, GOJ national, prefectural, and local authorities regarding lead, cadmium and chromium. Comply with the applicable requirements of the current issue of 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127, and EM 385-1-1. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirements apply. The following local laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead, cadmium and chromium-contaminated materials apply:

a. JEGS

1.5.3 Licenses, Permits and Notifications

Certify and submit in writing to the Contracting Officer at least 10 days prior to the commencement of work that licenses, permits and notifications have been obtained. All associated fees or costs incurred in obtaining the licenses, permits and notifications are included in the contract price.

1.5.4 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Lead, Cadmium, Chromium Waste Management Plan and the Lead, Cadmium, Chromium Compliance Plan, including procedures and precautions for the work.

1.6 EQUIPMENT

1.6.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead, cadmium and chromium dust, fume and mist. Respirators must comply with the requirements of 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127, and any other GOJ and local prefectural requirements on respirators.

1.6.2 Special Protective Clothing

Personnel exposed to lead, cadmium, chromium contaminated dust must wear proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during PWL or MCL handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead, cadmium and chromium removal work within the lead, cadmium and chromium controlled area. Personal protective equipment must include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE remains the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

1.6.6 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

1.6.7 Negative Air Pressure System

1.6.7.1 Minimum Requirements

Do not proceed with work in the area until containment is set up and HEPA filtration systems are in place. The negative air pressure system must meet the requirements of ASSE/SAFE Z9.2 including approved HEPA filters in accordance with UL 586. Negative air pressure equipment must be equipped with new HEPA filters, and be sufficient to maintain a minimum pressure differential of minus 0.005 kPa relative to adjacent, unsealed areas. Negative air pressure system minimum requirements are listed as follows:

a. The unit must be capable of delivering its rated volume of air with a clean first stage filter, an intermediate filter and a primary HEPA filter in place.

b. The HEPA filter must be certified as being capable of trapping and retaining mono-disperse particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.

c. The unit must be capable of continuing to deliver no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 0.625 kPa static pressure differential on a magnehelic gauge.

d. Equip the unit with a manometer-type negative pressure differential monitor with minor scale division of 0.005 kPa and accuracy within plus or minus 1.0 percent. The manometer must be calibrated daily as recommended by the manufacturer.

e. Equip the unit with a means for the operator to easily interpret the readings in terms of the volumetric flow rate of air per minute moving through the machine at any given moment.

f. Equip the unit with an electronic mechanism that automatically shuts the machine off in the event of a filter breach or absence of a filter.

g. Equip the unit with an audible horn that sounds an alarm when the machine has shut itself off.

h. Equip the unit with an automatic safety mechanism that prevents a worker from improperly inserting the main HEPA filter.

1.6.7.2 Auxiliary Generator

Provide an auxiliary generator with capacity to power a minimum of 50 percent of the negative air machines at any time during the work. When power fails, the generator controls must automatically start the generator and switch the negative air pressure system machines to generator power. The generator must not present a carbon monoxide hazard to workers.

1.6.8 Vacuum Systems

Vacuum systems must be suitably sized for the project, and filters must be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers (mean aerodynamic diameter) at a minimum efficiency of 99.97 percent. Properly dispose of used filters that are being replaced.

1.6.9 Heat Blower Guns

Heat blower guns must be flameless, electrical, paint-softener type with controls to limit temperature to 590 degrees C. Heat blower must be (grounded) 120 volts ac, and must be equipped with cone, fan, glass protector and spoon reflector nozzles.

1.6.10 Abrasive Removal Equipment

The use of powered machines for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Keep materials and equipment needed to complete the project available and on the site. Submit a description of the materials and equipment required; including Safety Data Sheets (SDSs) for material brought onsite to perform the work.

2.1.1 Expendable Supplies

Submit a description of the expendable supplies required.

2.1.1.1 Polyethylene Bags

Disposable bags must be polyethylene plastic and be a minimum of 0.15 mm thick (0.1 mm thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and capable of being made leak-tight. Leak-tight means that solids, liquids or dust

cannot escape or spill out.

2.1.1.2 Polyethylene Leak-tight Wrapping

Wrapping used to wrap lead, cadmium, chromium contaminated debris must be polyethylene plastic that is a minimum of 0.15 mm thick or any other thick plastic material shown to demonstrate at least equivalent performance.

2.1.1.3 Polyethylene Sheeting

Sheeting must be polyethylene plastic with a minimum thickness of 0.15 mm, or any other thick plastic material shown to demonstrate at least equivalent performance; and be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, provide flame-resistant polyethylene sheets which conform to the requirements of NFPA 701.

2.1.1.4 Tape and Adhesive Spray

Tape and adhesive must be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive must retain adhesion when exposed to wet conditions, including amended water. Tape must be minimum 50 mm wide, industrial strength.

2.1.1.5 Containers

When used, containers must be leak-tight and be labeled in accordance with EPA, DOT, GOJ, local prefecture, and OSHA standards.

2.1.1.6 Chemical Paint Strippers

Chemical paint strippers must not contain methylene chloride and be formulated to prevent stain, discoloration, or raising of the substrate materials.

2.1.1.7 Chemical Paint Stripper Neutralizer

Neutralizers for paint strippers must be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

2.1.1.8 Detergents and Cleaners

Detergents or cleaning agents must not contain trisodium phosphate and have demonstrated effectiveness in lead, cadmium and chromium control work using cleaning techniques specified by HUD 6780 guidelines.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 20 days prior to the start of any lead,

cadmium and chromium work.

3.1.1.2 Lead, Cadmium, Chromium Control Area

a. Physical Boundary - Provide physical boundaries around the lead, cadmium, chromium control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead, cadmium and chromium will not escape outside of the lead, cadmium and chromium control area. Prohibit the general public from accessing the lead, cadmium, chromium control areas.

b. Warning Signs - Provide bilingual warning signs in English and Japanese at approaches to lead, cadmium, chromium control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs must comply with the requirements of 29 CFR 1926.62.

3.1.1.3 Furnishings

Furniture and equipment will remain in the lead, cadmium, chromium control area. Protect and cover furnishings or remove furnishings from the work area and store in a location approved by the Contracting Officer.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead, cadmium, chromium control areas. Seal intake and exhaust vents in the lead, cadmium, chromium control area with 0.15 mm plastic sheet and tape. Seal seams in HVAC components that pass through the lead, cadmium, chromium control area.

3.1.1.5 Decontamination Shower Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

3.1.1.6 Eye Wash Station

Provide suitable facilities within the work area for quick drenching or flushing of the eyes where eyes may be exposed to injurious corrosive materials.

3.1.1.7 Mechanical Ventilation System

a. Use adequate ventilation to control personnel exposure to lead, cadmium and chromium in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Evaluate and maintain local exhaust ventilation systems in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

b. Vent local exhaust outside the building and away from building ventilation intakes or ensure system is connected to HEPA filters.

c. Use locally exhausted, power actuated tools or manual hand tools.

#### 3.1.1.8 Personnel Protection

Personnel must wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead, cadmium, chromium control area. No one will be permitted in the lead, cadmium, chromium control area unless they have been appropriately trained and provided with protective equipment.

## 3.2 ERECTION

### 3.2.1 Lead, Cadmium, Chromium Control Area Requirements

Establish a lead, cadmium, chromium control area by completely establishing barriers and physical boundaries around the area or structure where PWL or MCL removal operations will be performed.

## 3.3 APPLICATION

### 3.3.1 Lead, Cadmium, Chromium Work

Perform lead, cadmium, chromium work in accordance with approved Lead, Cadmium, Chromium Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead, cadmium, chromium when the work is performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 40 CFR 745, and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with the JEGS. U.S. federal, GOJ national, prefectural laws and regulations, and local requirements.

### 3.3.2 Paint with Lead, Cadmium, Chromium or Material Containing Lead, Cadmium, Chromium Removal

Manual or power sanding or grinding of lead, cadmium, chromium surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead, cadmium, chromium is prohibited. Provide methodology for removing lead, cadmium, chromium in the Lead, Cadmium, Chromium Compliance Plan. Select lead, cadmium, chromium removal processes to minimize contamination of work areas outside the control area with lead, cadmium, chromium contaminated dust or other lead, cadmium, chromium contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead, cadmium, chromium. Describe this removal process in the Lead, Cadmium, Chromium Compliance Plan.

Avoid deterioration of the substrate. Provide surface preparations for painting in accordance with Section 09 90 00 PAINTS AND COATINGS.

Provide methodology for lead, cadmium and chromium, LBP/PWL removal and processes to minimize contamination of work areas outside the control area with lead, cadmium, chromium contaminated dust or other lead, cadmium, chromium contaminated debris/waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead, cadmium, chromium. Describe this lead,, cadmium and chromium, LBP/PWL removal/control process in the Lead, Cadmium, Chromium Compliance Plan.

#### 3.3.2.1 Paint with Lead, Cadmium, Chromium or Material Containing Lead, Cadmium, Chromium - Indoor Removal

Perform manual removal in the lead, cadmium, chromium control areas using

enclosures, barriers or containments and powered locally exhausted tools equipped with HEPA filters. Collect residue and debris for disposal in accordance with the JEGS, U.S. federal, GOJ national, prefectural, and local requirements.

3.3.2.2 Paint with Lead, Cadmium, Chromium or Material Containing Lead, Cadmium, Chromium - Outdoor Removal

Perform outdoor removal as indicated in the JEGS, U.S. federal, GOJ national, prefectural, and local regulations and in the Lead, Cadmium, Chromium Compliance Plan. The worksite preparation (barriers or containments) must be job dependent and presented in the Lead, Cadmium, Chromium Compliance Plan.

3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead, cadmium, chromium controlled area, they must perform the following procedures and must not leave the work place wearing any clothing or equipment worn in the control area:

a. Vacuum all clothing before entering the contaminated change room.

b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.

c. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate shower facility, shower.

d. Change to clean clothes prior to leaving the clean clothes storage area.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

3.4.1.1 Air and Wipe Sampling

Conduct sampling for lead, cadmium, chromium in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and as specified herein. Air and wipe sampling must be directed or performed by the IH/PQP or IHT.

a. The IH/PQP or IHT must be on the job site directing the air and wipe sampling and inspecting the PWL or MCL removal work to ensure that the requirements of the contract have been satisfied during the entire PWL or MCL operation.

b. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the IH/PQP or IHT. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.

c. Submit results of air samples, signed by the IH/PQP or IHT, within 72-hours after the air samples are taken.

d. Conduct area air sampling daily, on each shift in which lead, cadmium and chromium and lead-based paint removal operations are performed, in areas immediately adjacent to the lead, cadmium and chromium control

area. Conduct sufficient area monitoring to ensure unprotected personnel are not exposed at or above 30 micrograms of lead per cubic meter of air or 2.5 micrograms of cadmium/chromium per cubic meter of air. If 30 micrograms of lead per cubic meter of air or 2.5 micrograms of cadmium/chromium per cubic meter of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Resume removal work only after the CP and the Contracting Officer give approval.

e. Before any work begins, a third party consultant must collect and analyze baseline wipe samples in accordance with methods defined by the JEGS, U.S. federal, GOJ national, prefectural, and local standards inside and outside of the physical boundary to assess the degree of dust contamination in the facility prior to lead, cadmium and chromium disturbance or removal. Provide Initial Sample Results to the Contracting Officer before work begins.

#### 3.4.1.2 Sampling After Removal

After the visual inspection, collect wipe samples according to the HUD protocol contained in HUD 6780 to determine the lead, cadmium and chromium content of settled dust in micrograms per square meter foot of surface area.

#### 3.4.1.3 Testing of Material Containing Lead, Cadmium, Chromium Residue

Test residue in accordance with 40 CFR 261 for hazardous waste.

## 3.5 CLEANING AND DISPOSAL

### 3.5.1 Cleanup

Maintain surfaces of the lead, cadmium, chromium control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead, cadmium, chromium operation has been completed, clean the controlled area of all visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Lead, Cadmium, Chromium Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The IH/PQP must then certify in writing that the area has been cleaned of lead, cadmium and chromium contamination before clearance testing.

#### 3.5.1.1 Clearance Certification

The IH/PQP must certify in writing that air samples collected outside the lead, cadmium, chromium control area during paint removal operations are less than 30 micrograms of lead per cubic meter of air and less than 2.5 micrograms of cadmium/chromium per cubic meter of air; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127; and that there were no visible accumulations of material and dust containing lead, cadmium, chromium left in the work site. Do not remove the lead, cadmium, chromium control area or roped off boundary and

warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

The third party consultant must certify lead surface wipe sample results collected inside the work area are less than 10 micrograms of lead per 0.1 square meter on floors, less than 100 micrograms of lead per 0.1 square meter on interior window sills and less than 400 micrograms of lead per 0.1 square meter on window troughs.

Certify surface wipe samples for cadmium and chromium are not significantly greater than the initial surface loading determined prior to work.

### 3.5.2 Disposal

a. Dispose of material, whether hazardous or non-hazardous in accordance with all laws and provisions and all JEGS, U.S. federal, GOJ national, prefectural laws and regulations or local regulations. Ensure all waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.

b. Contractor is responsible for segregation of waste. Collect lead, cadmium, chromium contaminated waste, scrap, debris, bags, containers, equipment, and lead, cadmium, chromium contaminated clothing that may produce airborne concentrations of lead, cadmium, chromium particles. Label the containers in accordance with the JEGS, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 40 CFR 261, 40 CFR 262 and corresponding state regulations.

c. Dispose of lead, cadmium, chromium contaminated material classified as hazardous waste at a locally approved hazardous waste treatment, storage, or disposal facility off Government property.

e. Handle, store, transport, and dispose lead, cadmium, chromium or lead, cadmium, chromium contaminated waste in accordance with the JEGS, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

f. All lead, cadmium, and chromium waste generation, management,and disposal will be coordinated with the host installation environmental function.

#### 3.5.2.1 Disposal Documentation

Coordinate all disposal or off-site shipments of lead, cadmium, and chromium waste with the host installation environmental function. Submit one copy of the completed hazardous waste manifest, signed and dated by the initial transporter in accordance with 40 CFR 262, JEGS, GOJ National, prefectural laws and local regulations. Provide a certificate that the waste was accepted by the disposal facility.

#### 3.5.2.2 Payment for Hazardous Waste

Payment for disposal of hazardous and non-hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal

facility is received and approved by the Contracting Officer. The manifest must detail and certify the amount of lead, cadmium, chromium containing materials or non-hazardous waste delivered to the treatment or disposal facility.

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SECTION 02 84 33

REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs)
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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPAN MINISTRY OF THE ENVIRONMENT(MOE)

| | |
|---|---|
| Act No. 137 | (1970, Amended 1991 and 2006) Waste Management and Public Cleansing Law |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| JEGS | (April 2024) Japan Environmental Governing Standards |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910.145 | Specifications for Accident Prevention Signs and Tags |
| 40 CFR 761 | Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions |
| 49 CFR 171 | General Information, Regulations, and Definitions |
| 49 CFR 172 | Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements |
| 49 CFR 173 | Shippers - General Requirements for Shipments and Packagings |
| 49 CFR 174 | Carriage by Rail |
| 49 CFR 175 | Carriage by Aircraft |
| 49 CFR 176 | Carriage by Vessel |
| 49 CFR 177 | Carriage by Public Highway |
| 49 CFR 178 | Specifications for Packagings |
| 49 CFR 179 | Specifications for Tank Cars |

## 1.2 REQUIREMENTS

The work includes the removal and disposal of PCB containing ballasts and transformers. The Contractor shall inspect, confirm and identify all PCB-containing items prior to commencement of work.Perform work in accordance with 40 CFR 761, JEGS, and the requirements specified herein.

## 1.3 DEFINITIONS

### 1.3.1 IH/PQP

An Industrial hygienist/private qualified person required by the Contractor.

### 1.3.2 Leak

Leak or leaking means any instance in which a PCB Article, PCB Container, or PCB Equipment has any PCBs on any portion of its external surface.

### 1.3.3 Lamps

Lamp is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic
spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

### 1.3.4 PCBs

PCBs as used in this specification shall mean the same as PCBs, PCB Article, PCB Article Container, PCB Container, PCB Equipment, PCB Item, PCB Transformer, PCB-Contaminated Electrical Equipment, as defined in the JEGS.

### 1.3.5 Spill

Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases.

## 1.4 QUALITY ASSURANCE

### 1.4.1 PCB and Lamp Management and Disposal Plan

Prior to handling any PCB items, the Contractor shall submit a PCB and Lamp Management and Disposal Plan. The submitted plan shall include the PCB and Lamp Removal and Disposal Work Plan, Qualifications of the IH/PQP, and Japan Industrial Waste Collection and Transport Permit.

### 1.4.2 Regulatory Requirements

Perform PCB related work in accordance with the JEGS, Act No. 137, and other applicable US Federal, GOJ, and local laws and regulations. Perform hazardous material-containing lamps storage and transport in accordance with the JEGS, Act No. 137, and other applicable US Federal, GOJ, and

local laws and regulations.

1.4.2.1 No Smoking

Smoking is not permitted within 15 m of the PCB control area. Provide "No Smoking" signs as directed by the Contracting Officer.

1.4.2.2 Work Operations

Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761 and the applicable requirements of this section, including but not limited to:

a. Obtaining advance approval of PCB storage sites.

b. Notifying Contracting Officer prior to commencing the operation.

c. Reporting leaks and spills to the Contracting Officer.

d. Cleaning up spills.

e. Maintaining an access log of employees working in a PCB control area and providing a copy to the Contracting Officer upon completion of the operation.

f. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.

g. Maintaining a spill kit as specified in paragraph entitled "PCB Spill Kit."

h. Maintaining inspection, inventory and spill records.

1.4.3 Training

Industrial Hygienist/Private Qualified Person (IH/PQP) shall instruct and certify the training of all persons involved in the removal of PCB containing materials/equipment and lamps containing hazardous substances. The instruction shall include: The dangers of PCB and hazardous material exposure, decontamination, safe work practices, and applicable OSHA and EPA, JEGS, GOJ, and prefectural regulations.

The IH/PQP shall review and approve the PCB and hazardous material-Containing Lamp Removal Work Plans and temporary on-site Storage Plans.

1.4.4 Regulation Documents

Maintain at all times one copy each at the office and one copy each in view at the job site of pertinent JEGS and a copy of the Contractor PCB and Lamp Removal and Disposal Work Plan.

1.4.5 Qualifications of IH/PQP

Include within the PCB and Lamp Management and Disposal Plan, the name, address, and telephone number of the Industrial Hygienist/Private Qualified Person selected to perform the duties in paragraph entitled "Industrial Hygienist/Private Qualified Person (IH/PQP)." Submit

Qualifications of IH/PQP that the Industrial Hygienist/Private Qualified Person is qualified, including certification number and date of certification or re certification. The IH/PQP shall have at least 2 years of on the job experience in hazardous materials and hazardous waste management and have working knowledge of the JEGS, GOJ, as well as US and Japanese occupational safety and health regulations. The IH/PQP shall have knowledge in detecting, identifying, and evaluating existing or potential hazardous conditions related to PCB-containing light ballasts and hazardous material-containing lamps and other similar building equipment or materials. The IH/PQP may be considered qualified if he/she is either a certified Industrial Hygienist or is a Private Qualified Person with adequate prerequisite experience and knowledge as listed in this section.

1.4.6 PCB and Lamp Removal and Disposal Work Plan

Submit a job-specific plan within 20 calendar days prior to removal work explaining the work procedures to be used in the removal, packaging, and storage of PCB-containing lighting ballasts and associated mercury-containing lamps. Include in the plan, requirements for Personal Protective Equipment (PPE), spill cleanup procedures and equipment, eating, smoking, restroom procedures, copies of all Japan Industrial Waste Disposal/Recycling Permits for facilities where the mercury-containing lamps or no-PCB Japan manufactured ballasts will be disposed/recycled, and GOJ Waste disposal/recycling permit for lamps listing Mercury-Using Electronic Product Waste ("Suigin Shiyo Seihin Sangyou Haikibutsu") as an accepted item. The plan shall comply with applicable requirements of Federal, JEGS, GOJ and prefectural PCB and mercury-related regulations. The IH/PQP must sign and approve the plan. Submit the signed plan to the Contracting Officer for review. Do not start work until approval is received. All US and foreign-made ballasts, even those marked "NO-PCB" shall be delivered to Bldg 3625, inside the 718 CES/CEIE Environmental Compound. Call DSN 6342600 5-days prior to delivery to schedule drop off.

The plan shall address:

a. Estimated quantity of US-made "NO-PCB" ballasts for delivery to the Government, US-made PCB or unidentifiable ballasts for delivery to the Government, foreign-made ballasts for delivery to the Government, Japan-made PCB or unidentifiable ballasts for delivery to the Government, Japan "NO-PCB" ballasts that the Contractor will commercially dispose/recycle and mercury-containing lamps the Contractor will commercially dispose/recycle.

b. List the names and qualifications of each Contractor that will be transporting, storing, recycling and disposing of the toxic wastes.

c. Furnish a copy of current prefecture-issued Industrial Waste permit that shows each company is certified by the prefecture to transport and dispose/recycle mercury-containing lamps or other waste.

d. Names and qualifications (experience and training) of personnel who will be working on-site with PCB and mercury-containing lamp wastes.

e. Spill prevention, containing, and cleanup contingency measures to be implemented.

f. The schedule for PCB and mercury-containing lamp waste removal, containment, storage, transportation, disposal and or recycling. Cleanup and containerizes all wastes daily.

### 1.4.7 Sorting, Characterization, and Final Disposition Preparations

The Contractor shall identify and sort all ballasts removed in preparation of final disposition as follows:

a. The contractor is responsible for the identification of all Japan-made ballasts as either "PCB-containing" or "NO-PCB" and the commercial disposal/recycling of all non-regulated ("NO-PCB") Japan-made ballasts.

b. The Contractor shall deliver US-made ballasts marked "NO-PCB", US-made ballasts without any PCB content marking, all foreign-made ballasts, unidentifiable ballasts without a label and/or those with unreadable labels, and Japan-made ballasts that the Contractor has determined contain PCB or that are not clearly identifiable to Bldg 3625, Kadena Air Base, located in the 718 CES/CEIE Environmental Compound.

### 1.4.8 Preparation for Delivery of Ballasts to the Government

If delivering more than 20 ballasts, the Contractor shall sort ballasts by country of manufacture and manufacturer. For quantities greater than 50, further sort the items marked "NO-PCB" separately from those without a PCB content marking. Sort and deliver ballasts on wooden or plastic pallets. In some cases, pallets may not be returned to the Contractor. Deliver ballasts to Bldg 3625 between 0800 and 1200 on any Friday except for federal holidays. If planning to deliver more than one pallet of ballasts, consult with the Hazwaste Program Manager at DSN 634-2600 in advance of the delivery date to request forklift assistance unloading pallets. Upon delivery, fill out and sign the Ballast Delivery Document recording the quantities and types as indicated on the form. Request a copy for submission as a mandatory closeout submittal.

The Government will visually inspect all ballasts for proper packaging as a condition of acceptance. The following items will be rejected by the Government:

a. Ballasts with wires longer than 2 inches (8cm).

b. Ballasts delivered in woven nylon demolition debris bags.

c. Ballasts delivered in Japanese or ISO waste drums.

d. Leaking ballasts not wrapped in nitrile bags or placed in other leak-preventative containers.

e. Ballasts attached to lighting fixtures. The contractor shall separate all ballasts from lighting fixtures and dispose of the fixtures separately as required.

### 1.4.9 PCB and Lamp Disposal Plan

Include within the PCB and Lamp Management and Disposal Plan, a PCB and lamp Disposal Plan within 45 calendar days prior to removal work. The PCB and Lamp Disposal Plan shall comply with applicable requirements of the JEGS and applicable U.S. federal, GOJ, and local prefecture and JEGS PCB regulations and address:

a. Identification of PCB wastes associated with the work.

b. Estimated quantities of wastes to be generated, disposed of, and recycled.

c. Names and qualifications of each Contractor personnel who will be working on-site with PCB and hazardous material-containing lamp wastes and that will be transporting, storing, treating, and disposing of the wastes. Include the facility location. Include a 24-hour point of contact. Furnish two copies of PCB and hazardous material-containing lamp waste permit applications and pertinent identification numbers, as required.

d. Spill prevention, containment, and cleanup contingency measures to be implemented.

e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

f. Work plan and schedule for PCB and hazardous material-containing lamp waste removal, containment, storage, transportation, disposal and or recycling. Wastes shall be cleaned up and containerized daily.

1.4.10 Training Certification

Submit certificates, prior to the start of work but after the main abatement submittals, signed and dated by the CIH and by each employee stating that the employee has received training. Certificates shall be organized by individual worker, not grouped by type of certificates.

1.4.11 Notification

Notify the Contracting Officer 20 days prior to the start of PCB removal work.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

*PCB and Lamp Removal and Disposal Work Plan; G

*PCB and Lamp Disposal Plan; G

*PCB And Lamp Management And Disposal Plan; G

SD-07 Certificates

*Qualifications of IH/PQP; G

Training certification

Japan Specially Controlled Hazardous Waste Disposal Permit (Submit separate SCIW Disposal Permits if lamps and PCB items are to be

disposed of at separate disposal sites.); G

*Japan Industrial Waste Collection And Transport Permit; G

Copy E of the Japanese Hazardous Waste Manifest

Notification

Certification of Decontamination for PCB Spill

Post cleanup sampling data

## 1.6 EQUIPMENT

### 1.6.1 Special Clothing

Work clothes shall consist of PPE as required by OSHA regulations, including, but not limited to the following:

a. Disposable coveralls

b. Gloves (Disposable rubber gloves may be worn under these)

c. Disposable foot covers (polyethylene)

d. Chemical safety goggles

e. Half mask cartridge respirator.

### 1.6.2 Special Clothing for Government Personnel

Provide PPE specified in paragraph entitled "Special Clothing" to the Contracting Officer as required for inspection of the work.

### 1.6.3 PCB Spill Kit

Assemble a spill kit to include the following items:

| ITEM | MINIMUM QUANTITY |
|---|---|
| 1. Disposable gloves (polyethylene) | 6 prs |
| 2. Gloves with a high degree of impermeability to PCB | 6 prs |
| 3. Disposable coveralls with permeation resistance to PCB | 4 ea |
| 4. Chemical safety goggles | 2 ea |
| 5. Disposable foot covers (polyethylene) | 6 prs |
| 6. PCB Caution Sign: "PCB Spill--Authorized Personnel Only" | 2 ea |

| | |
|---|---|
| 7. Banner guard or equivalent banner material | 30 m |
| 8. Absorbent material | |
| 9. Blue polyethylene waste bags | 5 bags |
| 10. Cloth backed tape | 5 ea |
| 11. Area access logs, blank | 1 roll |
| 12. Brattice cloth, 2 m x 2 m | 10 ea |
| 13. Rags | 1 piece |
| 14. Ball point pens | 20 ea |
| 15. Herculite, 1.5 m x 1.5 m and 3 m x 3 m | 2 ea and 1 ea |
| 16. Blank metal signs and grease pencils | |
| 17. Waste containers 208 liters drum, may be used as container for kit | 2 ea |

## 1.7 SCHEDULING

Notify the Contracting Officer 20 days prior to the start of PCB and hazardous material-containing lamp removal work.

# PART 2 PRODUCTS

Not used.

# PART 3 EXECUTION

## 3.1 WORK PROCEDURE

Furnish labor, materials, services, and equipment necessary for the removal of PCB containing lighting ballasts, associated mercury-containing fluorescent lamps, and high intensity discharge (HID) lamps in accordance with the JEGS, applicable GOJ and local, prefectural regulations. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury containing fluorescent lamps or high intensity discharge lamps.

### 3.1.1 Protection

a. Provide material and labor for construction of a decontamination room, a clean room, and shower facilities. Provide rooms with doors and attach to the exit ways of PCB work areas. Rooms shall be of sufficient size to accommodate the Contractor's operation within. Provide portable toilet and shower facilities. Locate shower facilities between the clean room and decontamination room. Provide separate clothing lockers or containers in each room to prevent contamination of street and work clothes.

b. Remove PCB-contaminated PPE in the decontamination room. Workers shall then proceed to showers. Workers shall shower before lunch and at the end of each day's work. Hot water, towels, soap, and hygienic conditions are the responsibility of the Contractor.

### 3.1.2 PCB Control Area

Isolate PCB control area by physical boundaries to prevent unauthorized entry of personnel. Food, drink and smoking materials shall not be permitted in areas where PCBs are handled or PCB items are stored.

### 3.1.3 Personnel Protection

Workers shall wear and use PPE, as recommended by the Industrial Hygienist, upon entering a PCB control area. If PPE is not required per the CIH, specify in the PCB removal work plan.

### 3.1.4 Footwear

Work footwear shall remain inside work area until completion of the job.

### 3.1.5 Permissible Exposure Limits (PEL)

PEL for PCBs is 0.5 mg/m3 on an 8-hour time weighted average basis.

### 3.1.6 Special Hazards

a. PCBs shall not be exposed to open flames or other high temperature sources since toxic decomposition by-products may be produced.

b. PCBs shall not be heated to temperatures of 55 degrees C or higher without Contracting Officer's concurrence.

### 3.1.7 PCB Caution Label

40 CFR 761, Subpart C. Affix labels to PCB waste containers and other PCB-contaminated items. Provide label with sufficient print size to be clearly legible, with bold print on a contrasting background, displaying the following: CAUTION: Contains PCBs (Polychlorinated Biphenyls).

### 3.1.8 PCB Caution Sign

29 CFR 1910.145. Provide signs at approaches to PCB control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area.

## 3.2 PCB TRANSFORMERS

### 3.2.1 Draining of Transformer Liquid

Perform work in accordance with the JEGS, 49 CFR 171, 49 CFR 172, 49 CFR 173, 49 CFR 174, 49 CFR 175, 49 CFR 176, 49 CFR 177, 49 CFR 178, and 49 CFR 179, Subchapter C and as specified herein. Drain the transformer, switches, and regulators of free flowing liquid prior to transportation. Place the drained liquids in DOT Spec 17E drums. The drums shall not contain more than 190 liters of oil. If the equipment cannot be drained, then place it in DOT Spec 17C drums.

3.2.2 Markings

Provide drums and drained PCB-contaminated electrical equipment with caution label markings as specified in paragraph entitled "PCB Caution Label" in both Japanese and English.

3.2.3 Laboratory Analysis

All transformers shall have a laboratory analysis for turn-in. DRMO prefers a gas chromatograph test. The only two exceptions to this rule are:

a. The transformer is hermetically sealed (solder sealed or fusion sealed. No access ports or openings).

b. The name plate states that the transformer contains pyranol, interteen, etc.

Attach a copy of the lab analysis to both the DD 1348-1 and the transformer itself.

3.2.4 Markings

3.2.4.1 Transformers, Less Than 0.5ppm

Add absorbent material to absorb residue oil remaining after draining. Write the date drained on the transformer. Turn in transformers to the DRMO Scrapyard. Telephone 471-3636 to schedule appointment for turn-in.

3.2.4.2 Transformers, Greater Than 0.5 ppm

Stencil date drained on the transformer.

3.2.4.3 Drums

Stencil on DOT-approved 208 liter drums containing PCB liquid the following (in English and Japanese):

a. ppm

b. Date drum filled

c. Serial number of transformer liquid came from

d. National Stock Number

(1) "9999-00-OIL" for <50 ppm

(2) "9999-00-CONPCB" for 50-499 ppm

(3) "9999-00-PCBOIL" for >500 ppm

Do not mix different ppms in the same drum. Drums must have a 50 mm ullage space from the top of the drum.

3.3 PCB REMOVAL

Select PCB removal procedure to minimize contamination of work areas with PCB or other PCB-contaminated debris/waste. Handle PCBs such that no skin

contact occurs. PCB removal process should be described in the work plan.

### 3.3.1 Confined Spaces

As feasible, do not carry out PCB handling operations in confined spaces. A confined space shall mean a space having limited means of egress and inadequate cross ventilation.

### 3.3.2 Control Area

Establish a PCB control area around the PCB item as specified in paragraph entitled "PCB Control Area." Only personnel briefed on the elements in the paragraph entitled "Training" and on the handling precautions shall be allowed into the area.

### 3.3.3 Exhaust Ventilation

If used, exhaust ventilation for PCB operations shall discharge to the outside and away from personnel.

### 3.3.4 Temperatures

As feasible, handle PCBs at ambient temperatures and not at elevated temperatures.

### 3.3.5 Solvent Cleaning

Clean contaminated tools, containers, etc., after use by rinsing three times with an appropriate solvent or by wiping down three times with a solvent wetted rag. Suggested solvents are stoddard solvent or hexane.

### 3.3.6 Drip Pans

Drip pans are required under portable PCB transformers and rectifiers in use or stored for use. The pans shall have a containment volume of at least one and one-half times the internal volume of PCBs in the item.

### 3.3.7 Evacuation Procedures

Procedures shall be written for evacuation of injured workers. Aid for a seriously injured worker shall not be delayed for reasons of decontamination.

## 3.4 PCB SPILL CLEANUP REQUIREMENTS

### 3.4.1 PCB Spills

Immediately report to the Contracting Officer any PCB spills on the ground or in the water, PCB spills in drip pans, or PCB leaks.

### 3.4.2 PCB Spill Control Area

Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

### 3.4.3 PCB Spill Cleanup

40 CFR 761, Subpart G. Initiate cleanup of spills as soon as possible,

but no later than 48 hours of its discovery. To clean up spills, personnel shall wear the PPE prescribed in paragraph entitled "Special Clothing" of this section. If misting, elevated temperatures or open flames are present, or if the spill is situated in a confined space, notify the Contracting Officer. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste. The spent absorbent shall be properly contained and turned over as solid PCB waste.

### 3.4.4 Records and Certification

Document the cleanup with records of decontamination in accordance with the JEGS and applicable US Federal, GOJ and prefectural requirements for PCB Spill Cleanup. Provide certification of decontamination.

### 3.4.5 Sampling Requirements

Perform post cleanup sampling as required by 40 CFR 761, Section 130, Sampling Requirements. Do not remove boundaries of the PCB control area until site is determined satisfactorily clean by the Contracting Officer.

## 3.5 STORAGE FOR DISPOSAL

### 3.5.1 Storage Containers for PCBs

49 CFR 178. Store liquid PCBs in Department of Transportation (DOT) Specification 17E containers. Store nonliquid PCB mixtures, articles, or equipment in DOT Specification 5, 5B, or 17C containers with removable heads.

### 3.5.2 Waste Containers

Label with the following:

a. "Solid (or Liquid) Waste Polychlorinated Biphenyls"

b. The PCB Caution Label, paragraph entitled "PCB Caution Label"

c. The date the item was placed in storage and the name of the cognizant activity/building.

### 3.5.3 PCB Articles and PCB-Contaminated Items

Label with items b. through c. above.

### 3.5.4 Approval of Storage Site

Obtain in advance Contracting Officer approval using the following criteria without exception.

a. Adequate roof and walls to prevent rainwater from reaching the stored PCBs.

b. An adequate floor which has continuous curbing with a minimum 150 mm high curb. Such floor and curbing shall provide a containment volume equal to at least two times the internal volume of the largest PCB article or PCB container stored therein or 25 percent of the total internal volume of all PCB equipment or containers stored therein, whichever is greater.

c. No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from the curbed area.

d. Floors and curbing constructed of continuous smooth and impervious materials such as portland cement, concrete or steel to prevent or minimize penetrations of PCBs.

e. Not located at a site which is below the 100-year flood water elevation.

f. Each storage site shall be posted with the PCB Caution Sign, paragraph entitled "PCB Caution Sign."

## 3.6 CLEANUP

Maintain surfaces of the PCB control area free of accumulations of PCBs. Restrict the spread of dust and debris; keep waste from being distributed over work area.

Do not remove the PCB control area and warning signs prior to thContracting Officer's approval. Reclean areas showing residual PCBs.

## 3.7 DISPOSAL TURNOVER

Turn in hazardous material-containing lamps, ballasts, and other PCB or hazardous material-containing materials to the Installation Environmental Division. Contact Installation Environmental Division at least 5 working days in advance to make arrangements for delivery of these materials to the storage site.

Do not dispose of mercury or PCB related materials at an off Government facility. Do not consider US manufactured light ballasts with "No PCBs" labeling to contain PCBs less than Japan regulatory limits and always acquire PCB content related information from the manufacturer. All ballasts, regardless of PCB or non-PCB containing types, shall be turned into the Installation Environmental Division per the turnover procedures as follows.

## 3.8 Ballasts

For removed ballasts that are not leaking, up to 300 ballasts may be stored on wooden or plastic pallets on-site for up to 30 days prior to delivery.

Ballasts that are leaking must be immediately stored in leak-proof drip pans, buckets, or double bagged in nitrile bags and stored in a secure area that is not exposed to rainfall. Mark the storage area in English and Japanese in accordance with the JEGS and Japan national and prefectural regulation.

Any PCB oil that has contaminated the ballast mount or other fixtures must be cleaned or removed and turned in with the ballasts. Prior to transport for disposal, the contractor shall perform the following:

a. Segregate ballasts by manufacturer.

b. Visit the websites of the manufacturers to verify if the ballasts contain PCB or not by product model number, product color, etc.

Certificates shall be obtained stating that the ballast does not contain PCB.

c. Sort the ballast in cardboard cases by Non-PCB, PCB containing, unknown for each manufacturer.

d. Bring ballasts to the Installation Environmental Division with certificates and supporting documents.

All non-Japanese ballasts, including those with a "NO PCB" label shall be assumed to contain as high as 49 ppm and shall be handled, stored, transported, and disposed of as PCB ballasts. The contractor shall deliver all non-Japanese ballasts to the 718 CES/CEIE Environmental Office at Bldg 3625. Ballasts may be delivered between 0800 and 1200 on any Friday except for federal holidays. Call DSN 634-2600 a minimum of 5-days prior to delivery to request forklift unloading assistance.

For Japanese-made ballasts, the Contractor shall segregate regulated PCB ballasts from non-regulated ballasts according to GOJ and prefectural regulations. Information to discriminate between regulated and non-regulated ballasts can be obtained from:
https://www.env.go.jp/recycle/poly/
https://www.env.go.jp/recycle/poly/law/no_14091618.pdf

Regulated PCB ballasts shall be delivered to the 718 CES/CEIE Environmental Office at Bldg 3625. Non-regulated Japanese ballasts become property of the contractor and shall be disposed of in accordance with GOJ and prefectural regulations. In the submitted PCB and Lamp Removal & Disposal Work Plan, clearly state how non-regulated Japanese ballasts will be disposed.

A copy of the Signed Ballast Turn-in (at Bldg 3625) Sheet shall be submitted to the COR.

Light ballasts may still contain PCBs even where a "No PCB" label exists on the ballast due to regulatory differences between U.S. and GOJ definitions for "PCB Free". PCB abatement or handling shall be in accordance with the JEGS.

The Contractor shall identify all project ballasts that contain and do not contain PCBs or are suspect to contain PCBs. The Contractor shall submit the PCB ballast list (to include suspect PCB ballasts) to the Contracting Officer Representative (COR). PCB containing ballasts and suspect PCB containing ballasts shall be segregated by country of manufacture.

The following procedures for US manufactured and Japan manufactured ballasts shall be used in the identification of PCB ballasts and described in this section.

### 3.8.1 For US Manufactured Ballasts

US manufactured ballasts shall not be mixed with Japan manufactured ballasts. The Contractor shall segregate and palletize US manufactured ballasts separately from Japan manufactured ballasts.

### 3.8.2 For Japan Manufactured Ballasts

The Contractor shall carefully examine the ballast to identify the manufacturer name and year made. Consult with the manufacturer to

identify any presence of PCBs. If absence of PCB cannot be confirmed, assume and treat the ballast as a PCB item.

Japan manufactured ballasts shall not be mixed with US manufactured ballasts. The Contractor shall segregate and palletize Japan manufactured ballasts separately from US manufactured ballasts.

### 3.8.3 For Unmarked/Unlabeled Ballasts

The Contractor shall treat all unmarked/unlabeled ballasts as suspect PCB-containing materials and deliver to Bldg 3625. Segregate unmarked/unlabeled ballasts from other US or Japanese manufactured items.

### 3.8.4 Fluorescent Light Tubes (Bulbs)

The Contractor shall carefully remove and store fluorescent light bulbs in a manner such that they remain intact. Fluorescent light tubes suspect for containing mercury shall be handled and disposed of by the Contractor in accordance to all GOJ, Federal, local prefectural laws and regulations and the JEGS. In the event of a lighting tube/lamp breaking, sweep and place waste in double plastic taped bags and dispose of as appropriate to GOJ, Federal, local prefecture laws and regulations and the JEGS.

## 3.9 Japan Specially Controlled Hazardous Waste Disposal Permit

In the submitted plan, include a copy of the Japan Specially Controlled Industrial Waste (SCIW) Permit (“Tokubetsu Kanri Haikibutsu Shobungyou Kyoka”) for the disposal or recycling facility where the hazardous material-containing lamps will be disposed. The permit must specifically say that the firm is authorized to accept hazardous material.

## 3.10 Japan Industrial Waste Collection and Transport Permit

Include a copy of the Japan Industrial Waste Collection and Transport Permit (“Sangyou Haikibutsu Shuushuu Unpangyou Kyoka”) for the transportation of hazardous material-contaminated wastes from the installation within the PCB and Lamp Management and Disposal Plan.

## 3.11 Japan Hazardous Waste Manifest (JHWM)

A minimum of 5-days prior to the scheduled transportation of hazardous material containing lamps or other PCB containing ballasts from the installation, contact the 718 CES/CEIE Environmental Section 634-2600 to schedule a pre-transportation inspection. A government representative will inspect, annotate the (JHWM), and authorize the shipment. No toxic wastes shall be transported off the installation without the approval of a US government representative.

Within 60-days after the date of transportation of hazardous waste from the installation, submit Copy E of the Japanese Hazardous Waste Manifest bearing the signature/stamp of the final hazardous material waste disposal/recycling facility as an SD-11 closeout submittal.

For SCIW shipments to disposal facilities outside the prefecture, the manifest must be the "tsumikae" type manifest to allow multiple Chain of Custody entries.

Contract final payment will not be approved by the COR until the Copy E is submitted.

Contractors failing to submit Copy E of the JHWM may be reported to United States Forces Japan (USFJ) and the Ministry of the Environment.

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MOLD REMEDIATION
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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

| | |
|---|---|
| AIHA IMOM08-679 | (2008) Recognition, Evaluation, and Control of Indoor Mold |

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

| | |
|---|---|
| ASSP Z9.2 | (2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems |

INSTITUTE OF INSPECTION, CLEANING, AND RESTORATION CERTIFICATION (IICRC)

| | |
|---|---|
| ANSI/IICRC S520 | (2015) Standard and Reference Guide for Professional Mold Remediation |
| IICRC S100 | (2015) S100 Standard and R100 Reference Guide for Professional Cleaning of Textile Floor Covering |
| IICRC S500 | (2015) Standard and Reference Guide for Professional Water Damage Restoration |

NATIONAL AIR DUCT CLEANERS ASSOCIATION (NADCA)

| | |
|---|---|
| NADCA ACR | (2021) Standard for Assessment, Cleaning, and Restoration of HVAC Systems |

NATIONAL ASSOCIATION OF MOLD REMEDIATORS AND INSPECTORS (NAMRI)

| | |
|---|---|
| NAMRI APR | Accreditation Program Requirements, Latest Edition |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910.134 | Respiratory Protection |
| 29 CFR 1926.59 | Hazard Communication |
| 29 CFR 1926.62 | Lead |
| 29 CFR 1926.1101 | Asbestos |

| | |
|---|---|
| 29 CFR 1926.1126 | Chromium |
| 29 CFR 1926.1127 | Cadmium |

UL SOLUTIONS (UL)

| | |
|---|---|
| UL 586 | (2009; Reprint Sep 2022) UL Standard for Safety High-Efficiency Particulate, Air Filter Units |

## 1.2 DEFINITIONS

### 1.2.1 AIHA

American Industrial Hygiene Association.

### 1.2.2 AIHA EMLAP

American Industrial Hygiene Association's Environmental Microbiology Laboratory Accreditation Program

### 1.2.3 AFU

Air filtration unit with High Efficiency particulate air (HEPA) filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining microbial contamination ASSP Z9.2. Filters must retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

### 1.2.4 Categories of Water

Category 1 Water: Water that originates from a sanitary water source and does not pose a substantial risk from dermal, ingestion, or inhalation exposure. IICRC S500

Category 2 Water: Water that contains significant contamination and has the potential to cause discomfort or sickness if contacted or consumed by humans. Can contain potentially unsafe levels of microorganisms or nutrients for microorganisms as well as other organic or inorganic matter. IICRC S500

Category 3 Water: Water that is grossly contaminated and can cause significant adverse reactions to humans if contacted or consumed. IICRC S500

### 1.2.5 Certified Industrial Hygienist (CIH)

An individual that has been certified by the Board for Global EHS Credentialing (BGC), formerly known as the American Board of Industrial Hygiene (ABIH), with professional qualifications and experience as required for an industrial hygienist, as presented in the definition of "Industrial Hygienist."

### 1.2.6 Complete Interior Building Demolition (Complete Gut)

Interior finishes of the building have been removed to expose basic structural elements.

1.2.7 Containment

Physical separation and engineering controls required to prevent contamination of undamaged materials and occupied areas. The level of containment varies depending on the extent of the contamination.

1.2.7.1 Source Containment

Use when the contaminated surface area is less than 0.93 square meters, in both residential and non-residential buildings. At a minimum, source containment must include the following (ANSI/IICRC S520):

a. Isolation of Work Areas. Install polyethylene barriers to isolate the areas or material to be demolished / remediated from non-remediation areas.

b. Floor protection. Maintain protection for finished floors through all construction activities.

c. HEPA vacuum to control dust created during the demolition. Hold HEPA vac intake at source of dust.

1.2.7.2 Limited Containment

Use when contaminated surface area is between 0.93 square meters and 9.3 square meters per room in both residential and non-residential buildings. At a minimum, limited containment includes the following (ANSI/IICRC S520):

a. Containment. For residential buildings, a containment includes the entire room where work is being performed. The containment does not extend past the extents of the room unless there are instances of contamination extending from one room to the next. For non-residential buildings, the containment includes the area to be remediated, plus enough additional area to allow for all equipment and work activities.

b. Isolation of Work Areas. Install polyethylene barriers to isolate the areas to be demolished / remediated.

c. Floor protection. Maintain protection for finished floors through all construction activities.

d. Air Filtration / Pressurization Control. Install AFUs with HEPA filters in the containment. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 5 pascals water column minimum to 10 pascals water column maximum relative to the outside and other adjacent spaces not undergoing remediation(AIHA IMOM08-679). AFUs must filter a minimum of four air changes per hour and a maximum of six air changes per hour ( ANSI/IICRC S520).

e. Protection for all items remaining in the containment. Protective devices or polyethylene wrapping or both must prevent physical damage (e.g., scratches and dents) and must provide a positive seal to prevent dust from settling in or on the items.

f. Decontamination. Construct a decontamination airlock for entry into

and exit from the work area. HEPA vacuum the sealed bags of contaminated debris within the airlock. When possible, locate the decontamination airlock so that the sealed bags can be passed directly from the airlock to the outside, through a door or window.

g. Containment Entrance. Install a triple-flap poly "door" to be used during demolition to provide a good separation between containment and occupied areas of the house / building.

h. HVAC System. Seal off all supply and return vents. HVAC may need to be shut down to ensure proper seal of the vents.

1.2.7.3 Full Containment

Use when contaminated surface area is greater than 9.3 square meters in both residential and nonresidential buildings. At a minimum, full containment includes the following(ANSI/IICRC S520):

a. Containment. For residential buildings, a containment includes the entire room where work is being performed. The containment does not extend past the extents of the room unless there are instances of contamination extending from one room to the next. For non-residential buildings, the containment includes the area to be remediated, plus enough additional area to allow for all equipment and work activities.

b. Isolation of Work Areas. Construct polyethylene barriers to isolate the areas to be demolished / remediated.

c. Floor protection. Maintain protection for finished floors through all construction activities.

d. Air Filtration / Pressurization Control. Install AFUs with HEPA filters in the containment. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 5 pascals water column minimum to 10 pascals water column maximum relative to the outside and other adjacent spaces not undergoing remediation (AIHA IMOM08-679). AFUs must filter a minimum of four air changes per hour and a maximum of six air changes per hour ( ANSI/IICRC S520).

e. Protection for all items remaining in the containment. Protective devices or polyethylene wrapping, or both must prevent physical damage (e.g., scratches and dents) and must provide a positive seal to prevent dust from settling in or on the items.

f. Decontamination. Construct a decontamination airlock for entry into and exit from the work area. HEPA vacuum the sealed bags of contaminated debris within the airlock. When possible, locate the decontamination airlock so that the sealed bags can be passed directly from the airlock to the outside, through a door or window.

g. Containment Entrance. Install a triple-flap poly "door" at the entrance to the airlock, and between the airlock and the work area during demolition to provide a good separation between containment and occupied areas of the house / building.

h. HVAC System. Seal off all supply and return vents. HVAC may need to be shut down to ensure proper seal of the vents.

1.2.7.4 Unoccupied Building Containment

Use when a building is unoccupied and large amounts of mold growth are present throughout the building:

a. Containment. The containment consists of the entire building. Install AFUs with HEPA filters in the building. Configure the AFUs to recirculate within the active remediation area. AFUs must filter a minimum of four air changes per hour and a maximum of six air changes per hour based on the size of the area undergoing active remediation ( ANSI/IICRC S520).

b. Isolation of Work Areas. Install polyethylene barriers to isolate remediation areas from non-remediation areas. AFU discharge may be used to positively pressurize non-remediation areas from areas undergoing remediation to prevent the movement of spores into "clean" areas.

c. Floor Protection. Maintain protection for finished floors through all construction activities.

d. Protection for all items remaining in the containment. Protective devices or polyethylene wrapping, or both must prevent physical damage (e.g., scratches and dents) and must provide a positive seal to prevent dust from settling in or on the items.

e. Decontamination. Construct a decontamination airlock for entry into and exit from the building.

f. Containment Entrance. Install a triple-flap poly "door" to be used during demolition to provide a good separation between containment and non-remediation areas of the house / building.

g. HVAC System. Seal off all supply and return vents. HVAC may need to be shut down to ensure proper seal of the vents.

1.2.7.5 Cleaning Containment

For items being salvaged, set up a temporary containment structure to clean items removed from the containment. At a minimum, the cleaning area must contain:

a. Two chambers. Construct walls with polyethylene. Clean the items in the first chamber. Store the clean items in the second chamber.

b. Air Filtration / Pressurization Control Cleaning Chamber. Install AFUs with HEPA filters in the cleaning chamber. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 5 pascals water column minimum to 10 pascals water column (maximum) relative to the storage chamber (AIHA IMOM08-679).

c. Air Filtration, Storage Chamber. Install AFUs with HEPA filters in the storage chamber. Configure the AFUs to allow air to recirculate within the chamber. AFUs must provide air filtration at a rate of

between four and six air changes per hour (ANSI/IICRC S520).

d. Containment Entrance. Install a triple-flap polyethylene "door" at the entrance to the cleaning chamber, between the cleaning and storage chambers, and at the exit of the storage chamber to provide a good separation between the chambers.

1.2.8 Decontamination Unit (Airlock)

An enclosed area adjacent to, and connected to, a regulated work area. It consists of various rooms that are used for the decontamination of workers, equipment, and materials.

1.2.9 Dehumidifier

Mechanism or machine to remove moisture from the air.

1.2.10 Detergent

A cleaning agent. The term refers to a prepared compound that may include surfactants, builders, dry solvents, softeners, etc, but does not include true soap.

1.2.11 Disinfectants or Biocide Sanitizing Solutions

One of three groups of antimicrobials registered by the EPA for public health uses. The EPA considers an antimicrobial to be a disinfectant when it destroys or irreversibly inactivates infectious or other undesirable organisms, but not necessarily their spores.

1.2.12 EPA

U.S. Environmental Protection Agency.

1.2.13 Fungal Growth Structures

Portions of fungi indicating active fungal growth is present on a surface. These include spores, conidiophores, hyphae, hyphal fragments, and mycelium.

1.2.14 Fungicidal Agents, (EPA)

An EPA registered fungicide that inhibits the spread and growth of mold with the ability to withstand moist and humid conditions.

1.2.15 HEPA Filter

A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97 percent of all particulate larger than 0.3 microns.

1.2.16 HVAC

Heating, Ventilating, and Air Conditioning (System).

1.2.17 Industrial Hygienist (IH)

An individual designated and provided by the Contractor that is a professional qualified by training, and experience to anticipate, recognize, evaluate, and develop controls for occupational and indoor air

quality hazards. The Industrial Hygienist must be a CIH or working under the supervision of a Certified Industrial Hygienist.

1.2.18 Microbial Remediation Supervisor

Individual responsible for the execution of the microbial remediation work as defined by the scope of work. This individual must have documented training in microbial remediation and have at least 3 years of experience in microbial remediation work.

1.2.19 NADCA

National Air Duct Cleaners Association

1.2.20 NAMRI

National Association of Mold Remediators and Inspectors

1.2.21 Non-Porous Material

A material that does not absorb nor is easily penetrated by liquids, especially water. Generally, non-porous materials have a permeable factor of less than one. Some examples are metal, glass, plastic, ceramic tile.

1.2.22 Occupied Spaces (Areas)

The phrase "occupied space" within this specification refers to spaces that are occupied by unprotected non-remediation personnel while work is in progress. It also refers to areas adjacent to work areas that are not currently undergoing remediation.

1.2.23 Personal Protective Equipment (PPE)

Any material or device worn to protect a worker from exposure to, or contact with, any harmful material or force. Standard PPE (such as hard hats, safety glasses, work boots, gloves) must be cleaned or disposed of prior to removal from the remediation work area.

1.2.24 Poly

Polyethylene sheet with a minimum thickness of 0.15 millimeter.

1.2.25 Porous Material

Permeable materials having the physical properties that allow liquids or gasses to pass through. These materials include but are not limited to the following: gypsum wall board, insulation, wallpaper, ceiling material, carpet, padding, paper goods (i.e., cardboard boxes, loose paper, books), stuffed furniture, wicker, fabrics.

1.2.26 Pressure Differential Measuring Instrument

Device used to measure the relative pressure difference between the work area/containment and areas outside the work area. For mold remediation, the device must measure accurately in the 0 to 10 Pascal of water range.

1.2.27 Semi-porous Material

A material that can absorb liquids if exposed over long periods of time.

These materials include but are not limited to wood, concrete, linoleum, vinyl wall covering, wooden or hardboard furniture, plaster.

1.2.28 Ventilation System Mold Remediator Qualifications (VSMR)

An individual certified by the National Air Duct Cleaners Association (NADCA) to clean HVAC systems.

1.2.29 Work Area

The area where remediation operations are actively performed and controlled to prevent the spread of dust / spores and entry by unauthorized personnel. A work area is the space, group of spaces, or the building.

1.3 REQUIREMENTS

1.3.1 Description of Work

Mold growth or mold impacted building materials have not been identified in this building. If mold contamination is observed in the buiding, the disturbance of mold impacted materials should be handled in accordance with these specifications.

a. Provide mold remediation work including the handling and control of mold contaminated materials and the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with mold products and spores that may be encountered during the renovation work. The work also includes the disposal of any mold contaminated materials generated by the work. Provide containment and engineering control techniques as outlined in this specification. All mold contaminated material removal work must be supervised by a microbial remediation supervisor as specified herein.

b. No work in this specification section can be provided by any person, contractor, or contracting entity involved in the preparation of the contract documents of which this specification section is a part.

c. The following microbial remediation specifications apply to the cleaning / removal and disposal of fungally-contaminated porous, semi-porous and non-porous surfaces within various types of structures. The level of containment and requirements for cleaning and remediation of materials depends on the condition of the space and materials being remediated.

d. Immediately after award of the contract, prepare a preliminary visual assessment report using the standard microbial assessment form (Appendix A) to document the condition of the work areas. Coordinate inspection with contracting officer. Include the HVAC systems inspection required elsewhere in this specification section. Submit this written pre-remediation condition report to the Contracting Officer for approval and instructions to proceed.

e. After approval of the preliminary visual assessment report and having instructions from the Contracting Officer to proceed, prepare a microbial remediation plan for approval by the Contractor's Certified Industrial Hygienist. Include an assessment of the risk for people occupying areas adjoining the remediation area while remediation work

is occurring in the microbial remediation plan. Upon the Contractor's CIH approval of the plan, submit the plan to the Contracting Officer for approval.

f. The Contractor's CIH or IH must monitor the site on a daily basis while remediation work is in progress, identifying work and work practices that are not in compliance with the approved microbial remediation plan, and performing all inspections required by this specification. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the contract.

g. This specification section includes the protocol regarding proper disposal of the removed building material components from within the work site.

h. Use proper cleaning procedures, engineering controls, and apply best management practices to remove microbial growth and spore fallout from all surfaces and building materials to minimize the further release of microbial spores. Address semi-porous and nonporous surfaces within the facility in each cleaning phase of the project. Damp wipe and HEPA vacuum all surfaces, at a minimum. Remove and dispose of porous building materials that are supporting microbial growth.

### 1.3.2 Security Requirements

Prior to granting access to any work area (i.e., building, area, room, or space) for mold remediation work, a determination will be made by the government agency whether classified or controlled unclassified information (paper material or electronic media) or equipment is contained in the work area(s).

It may be necessary depending on the sensitivity of the work area or the information contained in the area to authorize the Government activity or tenant command responsible for the work area to provide their own appropriately cleared military or government personnel to properly remove or secure any classified or controlled unclassified information, electronic media or equipment located in their work area(s). Prior authorization would be required and the area would need to be evaluated to ensure it is safe for personnel to enter and all personnel must utilize the required PPE to safely enter the work area.

a. If Contractor personnel require access to classified information or spaces to perform mold remediation work, the Government will issue the Contractor facility a Facility Clearance Level (FCL) (Contract Security Classification Specification) prior to the initiation of the work under the contract. If the Contractor facility does not possess a valid FCL issued by the Defense Security Service (DSS), the Government will be required to submit a sponsorship request to DSS requesting that the Contractor be processed for and issued a current FCL at the appropriate level.

b. Access to classified information (paper material, electronic media, and equipment) will only be granted to authorized and appropriately cleared government and U.S. contractor personnel that possess a personnel security clearance commensurate with the level of information contained in the work area that requires a mold remediation effort.

c. Access to Controlled Unclassified information (i.e., For Official Use Only, Sensitive but Unclassified, Privacy Act Information, Export Controlled unclassified) can be granted to DOD cleared contractors, consultants and grantees that are conducting official business for the DOD or DON. Non-cleared U.S. contractor personnel who only require access to controlled unclassified information can be granted access if they get a favorable trustworthiness determination on an individual Favorable Tier 1 investigation and fingerprint result submitted on their behalf by the government agency issuing the contract.

d. Classified information and controlled unclassified information must be safeguarded / secured, reproduced, and destroyed in accordance with installation specific procedures.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Ventilation System Mold Remediator Qualifications (VSMR); G

Preliminary Visual Assessment Report; G

Microbial Remediation Plan; G

Respiratory Protection Program; G

Worker Records

Certified Industrial Hygienist (CIH)/Industrial Hygienist (IH) Qualifications; G

Microbial Remediation Supervisor Qualifications; G

SD-03 Product Data

Disinfectants or Biocide Sanitizing Solutions; G

Fungicidal Agents, (EPA); G

Personal Protective Equipment (PPE); G

Pressure Differential Measuring Instrument

Safety Data Sheets (SDS) for All Materials; G

Dehumidifiers

Air Filtration Units

SD-06 Test Reports

IH Daily Reports; G

SD-11 Closeout Submittals

Submittals at Completion of Remediation Work; G

1.4.1 Preconstruction Submittals

Within 10 days from the award of the contract and prior to the start of the work, submit to the Contracting Officer six copies of the following items for review and permanent file.

1.4.1.1 Preliminary Visual Assessment Report

A written report to document the pre-remediation condition of the work areas and the results of the HVAC systems inspection.

1.4.1.2 Microbial Remediation Plan

Submit a job-specific, detailed plan approved by the Contractor's CIH to the Contracting Officer for final approval prior to start of work. Address the following items in the plan at a minimum:

a. Description of materials to be remediated, providing location and quantities (map if available), and methods to be used for remediation.

b. Products: Disinfectants, detergents, biocides, sanitizing solutions, and fungicidal agents, (EPA).

c. Containment procedures to include description and locations of engineering controls and decontamination unit to include entry and exit procedures (provide sketch of floor plan showing location of containment barriers and decontamination units). Include locations of AFUs and AFU discharges to the outside.

d. Description of personal protective equipment to be used during the remediation.

e. Construction barricades and barriers in occupied areas.

f. HVAC Shut down and start-up procedures.

g. HVAC Evaluation and remediation procedures.

h. Moisture and relative humidity control procedures and equipment.

i. Packaging and disposal procedures.

j. Safety Precautions to include lockout / tag-out, fall protection, confined space entry procedures, and fire protection.

k. Description of the method to be employed to control cross contamination of areas not in the work area. Include a risk assessment related to the suitability of people to occupy areas adjoining the remediation area while remediation activities are ongoing.

l. IH Quality Control procedures to include visual inspection.

m. Procedures to control, abate, and dispose of Asbestos Containing

Materials (ACM), Presumed Asbestos Containing Materials (PACM) and Lead Based Paint (LBP) coincident with microbial remediation. Identify ACM, PACM, and LBP before work begins; Identify the presence, location, and quantity of ACM,PACM, and LBP therein pursuant to paragraphs (g),(k)(1) of 29 CFR 1926.1101 and for lead 29 CFR 1926.62.

1.4.1.3 Respiratory Protection Program

Provide written copy of Contractor's Respiratory Protection program.

1.4.1.4 Worker Records

Provide the following documents for all workers, including supervisory personnel. If new workers are added to the crew, provide the same documentation for them.

a. Employee Fit test records and Physician medical evaluation approval records.

b. Employee Instruction and Release Form: Provide documentation showing that each employee has been instructed on the following items:

(1) Use and fit of respirators (for employees entering and working in the containment).

(2) Protective clothing.

(3) Protective measures.

(4) Safety and Emergency Egress Procedures.

(5) Site specific plans and training such as fall protection, Lock out/tag out, confined space, or other appropriate safety and health programs that address specific risks of the affected work areas.

(6) Microbial remediation hazards and practices including engineering controls and isolation. Training should include "hands on" training for microbial remediation supervisors.

(7) Workers' release forms stating the potential hazards involved with the scope of the work.

c. Worker Training Certification: Submit copies of training certificates for each employee indicating that the employee has received training at the appropriate level for the work prescribed in the description of work.

1.4.1.5 Certified Industrial Hygienist (CIH)/Industrial Hygienist (IH) Qualifications

Submit the name, address, and telephone number of the Certified Industrial Hygienist (CIH) and Industrial Hygienist (IH). Provide resume to document field experience.

1.4.1.6 Microbial Remediation Supervisor Qualifications

Submit documentation that the onsite supervisor is trained in microbial remediation with at least 3 years of experience in microbial remediation

work.

1.4.2 Product Data

Within 10 days of contract award, submit product data for items identified for use in Microbial Remediation Plan.

1.4.3 IH Daily Reports

Prepare a written IH Daily Report for each day that microbial remediation work is being accomplished. Submit the IH Daily Report to the Contracting Officer by 1000 hours of the following day. The IH Daily Report at a minimum must include measurements of differential pressure and temperature and relative humidity in work areas, and detail any non-compliance issues observed.

1.4.4 Submittals at Completion of Remediation Work

Within 14 days of completion, provide the following information:

a. Daily Project Logs.

b. IH Daily Reports.

c. Photographic Logs.

d. Contractor's Industrial Hygienist Report certifying the microbial remediation is complete.

1.5 RECORD KEEPING

A Daily Project Log forms a permanent record of the project. Secure and maintain these logs and any other required documentation as part of the permanent project file.

1.5.1 Daily Project Log

The Microbial Remediation Supervisor must maintain a Daily Project Log, which is used each day of the project to document the following information.

a. Date.

b. Name of Microbial Remediation Supervisor.

c. Name of Industrial Hygienist monitoring work area.

d. Number of workers on site.

e. Equipment utilized.

f. Brief description of daily work activities.

g. Listing of any non-compliance noted, emergencies, stop work orders (with detailed explanation), and descriptions of any other significant events.

# PART 2 PRODUCTS

## 2.1 DISINFECTANTS, BIOCIDES, SANITIZING SOLUTIONS AND FUNGICIDAL AGENTS, (EPA)

EPA Registered chemical agents for the use detailed in the Microbial Remediation Plan and used in accordance with the manufacturer's specifications. Provide SDS sheets to the Contracting Officer for any chemicals that are used during the performance of the work for approval.

## 2.2 HAZARD COMMUNICATION

Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Safety Data Sheets (SDS) for all materials brought to the site.

# PART 3 EXECUTION

## 3.1 EQUIPMENT

Provide manufacturer's certificate of compliance for all equipment used to contain the microbial contamination.

### 3.1.1 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services. Provide personnel engaged in set-up, pre-cleaning, cleanup, handling, and removal of contaminated materials with the appropriate respiratory protection as specified in 29 CFR 1910.134. Microbial remediation plan must consider Table 17.1 in AIHA IMOM08-679 "Recognition, Evaluation, and Control of Indoor Mold", which lists the minimum levels of respiratory protection based on the activity and size of the remediated area.

### 3.1.2 Protective Clothing

Provide all workers with protective clothing as appropriate for the work being accomplished, as required by the Microbial Remediation Plan.

### 3.1.3 Warning Signs and Labels

Provide bilingual warning signs printed in English and Japanese at all approaches to the work areas in accordance with IICRC S500. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Warning signs may be in the form of continuous plastic tape. Provide the warning signs with black characters on a yellow background.

WARNING
DO NOT ENTER
MICROBIAL REMEDIATION WORK IN PROGRESS

Alternate wording for the warning signs will be approved by the Contracting Officer.

### 3.1.4 Dehumidifiers

Install and use dehumidifiers as needed during the remediation to maintain

relative humidity below 60 percent in the work area. Drain the condensate water to a permanent drain, or empty as needed to prevent water overflowing from the dehumidifiers.

### 3.1.5 Air Filtration Units (AFU)

Install and use AFUs with HEPA filters, and manufacturer specified pre-filters, as part of the exhaust ventilation system to develop and maintain the specified desired air pressure differential inside the enclosed work area relative to the outside areas. Acquire and pay for any licenses needed for use of any equipment, including but not limited to, air pressure differential systems and air filtration systems.

a. Replace HEPA filters and pre-filters for AFUs as required to maintain pressurization performance requirements during demolition and cleaning. Do not reuse filters. Bag used filters at a minimum in clear 0.15 millimeter polyethylene bags within the containment and disposed as contaminated waste.

b. Discharge air from any AFUs located in the work area containment to the outside environment when creating a negative pressure containment to create a negative pressure relative to the outside and adjacent work areas not undergoing active remediation of 5 pascals to 10 pascals AIHA IMOM08-679. Discharge air in excess of that required for creating the proper negative pressure to the work area. The AFUs must provide four to six air changes per hour in the work area ( ANSI/IICRC S520). Under no circumstances may air from AFUs discharge to an occupied area. Coordinate location of window sashes or doors required for discharge openings with the Contracting Officer. Exhaust discharge openings may be constructed of plywood, and the seals around such opening must be airtight.

c. Seal all exhaust and intake openings in AFUs with one layer of 0.15 millimeters polyethylene sheeting when not in use.

### 3.1.6 Vacuum Cleaners Equipped with HEPA Filters

Provide vacuum cleaners equipped with HEPA filters designed for continuous operation in order to complete the work in a timely and efficient manner.

a. Provide nozzle attachments as required to adequately remove all dust. As a minimum, include crevice and extended bristle brush nozzles. Only use a vacuum equipped with a HEPA filter.

b. Provide sufficient vacuum cleaners equipped with HEPA filters designed for continuous operation in the work area during microbial remediation inside the containment area.

c. Provide additional vacuum cleaners equipped with HEPA filters in the enclosed work area during remediation or cleaning work as required by the size (area) of the containment and to maintain timely progress of the work.

## 3.2 GENERAL REQUIREMENTS

### 3.2.1 Pre-Microbial Remediation Work Conference

Meet with the Contracting Officer prior to beginning work to discuss in detail the Microbial Remediation Plan, including work procedures and

safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if a part of this specification. Any variances to the specification as a result of the plan must be specifically identified to allow for free discussion and approved by the Contracting Officer in writing prior to starting work. Before work in areas with Asbestos Containing Materials (ACM), Presumed Asbestos Containing Materials (PACM) and Lead begins, identify the presence, location, and quantity of ACM, PACM and Lead. Ensure proper notification of regulatory authorities. Consult with Contracting Officer to obtain facility ACM / LBP surveys. Mitigate any disturbance of painted/coated surfaces in accordance with 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1926.1127.

### 3.2.2 Containment Entry / Exit Procedure

Ensure that each worker and authorized visitor follows entry and exit procedures detailed in the Microbial Remediation Plan.

## 3.3 REMOVAL PROCEDURES

### 3.3.1 Protection of Existing Work Areas

Perform work in a manner to minimize the damage or contamination to areas outside or directly adjacent to the work area. Inspect areas inside and outside proposed work areas to identify existing damage and notify Contracting Officer prior to start of work.

Where materials outside work area are damaged or contaminated as a result of the Contractors work efforts as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting officer. Should adjacent or outside areas become contaminated as a result of the Contractors work efforts, stop work immediately. Clean the newly contaminated areas at no additional expense to the Government. The work may proceed at the discretion of the Contracting Officer once the area has been verified by visual inspection as restored.

### 3.3.2 Remediation of Fungally Contaminated Building Materials

Should mold be found, the removal of contaminated materials must follow in general the listed sequence of work. The Contractor may make changes to improve work flow with the approval of the Contracting Officer.

a. Provide level of containment and PPE required by the Microbial Remediation Plan.

b. Disable all HVAC units and exhaust fans in the area to be remediated. Cover and seal all supply vents, return vents, and air handling units in the project area using two layers of 0.15 millimeter poly.

c. Protect materials to remain in work area. Where possible, clean all materials to be salvaged in place to prevent possible cross-contamination created by moving materials through non-remediation areas.

d. Remove undamaged items and materials to be cleaned and salvaged from the work area. Store materials in an area with relative humidity maintained below 60 percent and where temperatures will not damage the material. Notify Contracting Officer of existing damage to items

prior to removal.

e. Set up containments, including protection of materials remaining within the containment and AFUs. Notify Contracting Officer that the area is prepared for remediation activities.

f. Pre-demolition inspection by the Contracting Officer.

g. Demolition and removal / cleaning of contaminated materials.

h. Post-remediation inspection by the Contracting Officer.

i. Perform final cleaning in the containment.

j. Clean carpet in the containment if salvageable.

k. Clearance inspection by the Contracting Officer.

l. Duct and HVAC cleaning, if necessary.

m. Deconstruction of containment, removal of AFUs.

n. Return previously items that were removed and cleaned to the occupied area.

### 3.3.3 Remediation Procedures

#### 3.3.3.1 Remediation of Non-Porous Materials

Method of remediating non-porous items:

a. HEPA vacuum all surfaces.

b. Damp wipe all surfaces using an anti-microbial detergent solution.

c. Ensure all cleaned surfaces are dried thoroughly.

#### 3.3.3.2 Semi-Porous Materials (Unfinished Wood)

Use this method for remediating unfinished wood-based items, including wood and wood framing in wall cavities:

a. Cleaning

(1) HEPA vacuum all surfaces.

(2) Scrub surfaces with a brush and detergent to remove mold.

(3) Ensure all cleaned surfaces are dried thoroughly.

(4) HEPA vacuum all surfaces to remove dust.

(5) Repair finishes as required to match original.

b. Removal

c. Where unfinished wood product has been structurally damaged, remove and replace with an equivalent product. This includes wall studs and sheathing, such as OSB used in flooring, wall, or roof construction.

Lightly mist mold contaminated material before removal.

3.3.3.3 Semi-Porous Materials

Use this method for surface cleaning semi-porous materials such as concrete, vinyl wall covering, linoleum, leather furniture, and finished wood products:

a. HEPA vacuum all surfaces.

b. Damp wipe surfaces using clean water or a detergent solution. Avoid over-wetting the material. Ensure all materials are dried thoroughly

3.3.3.4 Porous Materials

a. Carpet

(1) Removal: Remove carpet that has remained wet for 48-hours or longer (AIHA IMOM08-679). If carpet has dried out, lightly mist before removal.

(2) Cleaning (for carpet that has been wet for less than 48-hours) AIHA IMOM08-679: Use a dry absorbent compound cleaning method as designated by IICRC S100. This method uses an absorbent compound to dissolve, suspend and absorb carpet soils. It does not add moisture back into the carpet. Ensure carpet is dried thoroughly after cleaning

b. Gypsum Wallboard (GWB)

(1) Removal: Remove Gypsum Wallboard that has remained wet for 48-hours or longer (AIHA IMOM08-679), or has visible mold growth. Where removal of GWB exposes insulation, remove the insulation. Lightly mist all contaminated materials before removal.

(2) Surface Cleaning: Where GWB has a small amount of surface mold growth and the GWB is structurally sound, a surface cleaning method may be used with the permission of the Contracting Officer. HEPA vacuum all surfaces and wipe down with a detergent solution. Do not use surface cleaning where mold growth penetrates wallboard substrate. Thoroughly dry the cleaned areas and paint to lock down any residual spores.

c. Ceiling Tile

(1) Removal: Remove ceiling tile that has remained wet for 48-hours or longer, or has visible mold growth (AIHA IMOM08-679). If ceiling tile has dried out lightly mist before removal.

d. Paper/Electronic Media and Sensitive Equipment

e. Classified and Controlled Unclassified Information whether it is paper, electronic media or equipment must be properly safeguarded / secured until it is properly destroyed in accordance with installation specific procedures and it cannot be discarded without utilizing the proper destruction methods. Contractor personnel cannot be granted access to classified information or Controlled Unclassified Information until they have met the security requirements stated in

the paragraph SECURITY REQUIREMENTS.

(1) Removal: Only papers or documents that are unclassified and do not contain controlled unclassified information can be discarded in the trash. Classified and Controlled Unclassified information must be destroyed by appropriately cleared military, government or contractor personnel using an approved DOD destruction method for that specific level of information. Discard paper materials that have remained wet for 48-hours or longer, or that have visible mold growth. Paper materials that have been wet for less than 48-hours may be allowed to dry if approved by the Contracting Officer.

(2) Containment: Where paper materials, such as personnel records must be retained, the following containment methods may be used with the permission of the Contracting Officer. The method of containment for paper products is as follows:

(a) Thoroughly dry the paper material. Safeguard Classified and Controlled Unclassified Information at all times in a GSA approved security container, restricted area, vault, or under the direct physical control of appropriately cleared personnel.

(b) Where routine access to the material is required, a copy must be made. Contractor personnel must not reproduce copies of classified information or controlled unclassified information without the prior written approval of the Contracting Officer and the Government Agency Security department with responsibility for the work area. If approval is obtained, only appropriately cleared Contractor personnel are authorized to reproduce the information and they must use only DOD authorized reproduction equipment.

(c) When not in use, secure the classified and controlled unclassified information in an approved GSA security container, restricted area, or vault. Limit access to the container to only appropriately cleared personnel. Implement an access procedure involving opening the container in a secure area with provision for capturing mold spores and respiratory protection for workers opening the container for these materials. Store the container in an area where the relative humidity is maintained below 60 percent to prevent further mold growth.

f. Textiles

(1) Discard textiles with visible mold growth.

(2) Clean textile based items, including clothing, linens, and toys that do not have visible mold growth, but have been wet, in standard commercial or residential washing machines with standard washing machine detergent.

(3) Dry all items completely before returning to the building / house.

(a) When possible, use dryers to dry items.

(b) If dryers will cause irreversible harm to the item, hang the

item on a drying rack in a temperature and humidity controlled space. Discard items not dry within 48-hours ( AIHA IMOM08-679).

g. Upholstered Furniture

(1) Removal: Discard upholstered furniture that has remained wet for 48-hours or longer (AIHA IMOM08-679), or that have visible mold growth.

(2) Cleaning: Clean upholstered furniture that has been exposed to mold spores but does not have visible mold growth by HEPA vacuuming upholstery and wood or metal structure, followed by a damp wipe of semi-porous or non-porous portions of the furniture. Dry furniture thoroughly after cleaning.

## 3.4 DETAILED SEQUENCE OF WORK FOR MOLD REMOVAL UNDER CONTAINMENT

### 3.4.1 Preparation for Remediation Work

a. Provide level of containment and PPE required for the remediation based on the Microbial Remediation Plan.

b. Disable all HVAC units and exhaust fans in the area to be remediated.

c. Remove undamaged materials from the work area if they are to be salvaged but cannot be cleaned in place. Store materials in an area with relative humidity maintained below 60 percent and where temperatures will not damage the material. Notify Contracting Officer of existing damage to items prior to removal. Clean materials using procedures detailed in Remediation Procedures.

d. Remove supply diffusers, return grilles and exhaust grilles. Clean diffusers and grilles using procedures detailed in Remediation Procedures.

e. Construct containment barriers. Existing walls can be used as a portion of the containment barriers if existing openings in walls (such as doors, wall openings, vents) are sealed using 0.15 millimeter polyethylene.

f. Install the AFUs and dehumidifiers.

g. Seal supply, return, and exhaust openings with 0.15 millimeter polyethylene sheeting and protect intakes to air handling units. Air handling units are to remain off.

h. Install all equipment needed for removal work in the containment area to minimize egress during demolition.

i. The Contracting Officer will inspect the containment to verify that the containment is properly constructed and the containment area has an overall negative pressure of 5 to 10 pascals water column AIHA IMOM08-679 relative to the outside and adjacent work areas not undergoing active remediation, prior to beginning demolition work.

### 3.4.2 Demolition

a. Remove mold contaminated materials to be discarded, such as paper, and

furniture. Double bag material in 0.15 millimeter poly bags. Seal poly bags using duct tape inside the containment. HEPA vacuum bags before removing them from the containment or airlock. When possible, pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster. Do not leave the bags at the building / house.

b. Lightly mist all contaminated materials that are being discarded to minimize generation of airborne mold spores during demolition/removal.

c. Remove contaminated gypsum wallboard (GWB) at the preliminary limits of demolition specified in the Microbial Remediation Plan. Inspect back side of removed GWB. If mold is observed on the back side of the GWB, report this condition to the Contracting Officer. After obtaining Contracting Officer approval, continue removing GWB until no mold is observed. If hidden mold is discovered that will extend past the extents of the containment, stop work immediately and reconstruct the containment to extend past the suspected contamination. Re-evaluate level of containment and PPE. Continue to operate AFUs during reconfiguring of containment.

d. Remove drywall by cutting in pieces as large as possible to minimize aerosolization of fungal spores. Drywall screws can either be backed out during removal or later during cleanup.

e. Use dust collection attachments on all power tools, such as sanders, saws, to capture dust created when using the tools. Outlet of dust collector should discharge into inlet of AFU.

f. Remove fiberglass insulation behind removed gypsum board.

g. If wood studs are contaminated, HEPA vacuum all surfaces, scrub them with a brush and detergent to remove mold. After scrubbing studs, HEPA vacuum again to remove any remaining dust. Replace wood studs with damage severe enough to reduce the structural capacity of the member. Prior to removal of any structural member consult with the Contracting Officer.

h. Clean all metal framing with a dilute detergent solution. Clean metal framing with light rust using steel wool and coat with a rust inhibiting paint. Replace metal framing with rust damage severe enough to reduce the structural capacity of the member. Prior to removal of any structural material, consult with the Contracting Officer.

i. Remove contaminated carpet scheduled for removal.

j. Place removed gypsum board, insulation, carpet and remaining debris in two layers of 0.15 millimeter poly bags. Seal poly bags using duct tape inside the containment. HEPA vacuum bags before removing them from the containment or airlock. When possible pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster. Do not leave the bags at the building / house.

k. Remediation workers must HEPA vacuum their PPE, then remove their PPE within the airlock chamber. Discard disposable coverall suits into a 0.15 millimeter poly bag.

3.4.3 Post-Demolition Inspection

a. The Contracting Officer will inspect the containment area to verify that all contaminated materials have been removed.

b. Allow a minimum of 12-hours after completion of removal work, with AFUs operating, for airborne dust in the containment to settle or be removed by the AFUs.

3.4.4 Cleaning after Demolition, and Cleaning of Settled Spores from Porous / Non-Porous Materials

a. Continue to operate AFUs during cleaning.

b. Clean exposed surfaces.

(1) HEPA vacuum all surfaces.

(2) Damp wipe all non-porous exposed surfaces including polyethylene sheets used to protect materials, external surfaces of ductwork, studs, and floors with clean rag and clean potable water or detergent solution.

(3) Remove poly sheeting inside the containment.

(4) HEPA vacuum all surfaces protected by poly sheeting.

(5) Damp wipe non-porous surfaces protected by poly sheeting with clean water or a detergent solution.

(6) Clean carpet using procedures previously specified in paragraph POROUS MATERIALS above.

c. Final clearance inspection will be conducted by the IH. Clearance inspections will be performed using the procedures detailed in Post-Remediation Inspection. If areas fail final clearance inspections, additional corrective actions taken by the contractor must be at no additional cost to the Government. Maintain containments in place until spaces are inspected and accepted by the Government as being fully remediated. The Government will determine whether additional cleaning is required by the Contractor and whether the clearance process must be repeated.

3.5 DUCT AND HVAC SYSTEM CLEANING

3.5.1 Contractor Qualifications

a. The HVAC cleaning contractor must be a certified member of NADCA.

b. The HVAC cleaning contractor must have at least one individual with Ventilation System Mold Remediator Qualifications certified by NADCA onsite during duct and HVAC system cleaning.

3.5.2 Inspection

IH must visually inspect the HVAC system serving all work areas, and determine if additional remediation is needed to clean the HVAC system, thus preventing re-contamination. Coordinate inspection with the contracting officer. Notify the Contracting Officer of the inspection

results. The Contractor must receive written approval from the Contracting Officer before proceeding with HVAC microbial remediation.

3.5.3 HVAC Microbial Remediation

Conduct the following actions if authorized by the Contracting Officer.

a. Follow requirements of the NADCA ACR "Standard for Assessment, Cleaning, and Restoration of HVAC Systems" and/or NAMRI APR guidelines.

b. Using a "gassing" or "fogging" method of cleaning with gaseous chlorine dioxide or ozone is not allowed.

c. Disable all HVAC equipment prior to cleaning any component of the system.

d. Use this method for cleaning the air handling units, terminal units, blowers and exhaust fans:

(1) Construct a limited containment around equipment to be cleaned. Provide appropriate PPE for workers.

(2) Remove filters. Seal filters in 0.15 millimeter poly bags for disposal.

(3) Disassemble units as necessary to clean components. Contractor is responsible for correctly reassembling equipment after cleaning.

(4) Clean disassembled components within the containment or in a separate two chamber cleaning containment. Seal disassembled components in 0.15 millimeter poly bags for transport out of building / house. HEPA vacuum bags before removing them from the containment or airlock.

(5) HEPA vacuum all surfaces.

(6) Damp wipe all non-porous surfaces and components with clean water or a detergent solution.

e. Use this method for cleaning HVAC coils:

(1) Clean coils using a method that renders the coil visibly clean. Coil cleaners must be non-acidic / alkaline, detergent based. Clean condensate drain pans. The drain for the condensate drain pan must be operational during the cleaning.

(2) Rinse coils and drain pans with clean water to remove any latent residues.

(3) Cleaning methods must not cause damage to the coil surface or fins.

(4) Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil is considered clean only if the coil is free of foreign matter and chemical residue.

f. Use this method for cleaning the duct system:

(1) During cleaning, connect a vacuum collection system to the downstream end of the section being cleaned. The vacuum collection device must be of sufficient power to render all areas of duct being cleaned under negative pressure relative to rooms and areas of duct not being cleaned. Verify negative pressure at the furthest point from the collection system with a micromanometer and include verification measurements in the IH Daily Report.

(2) Equip the vacuum collection systems with HEPA filters. Exhaust the vacuum collection systems directly to the outside.

(3) Use mechanical agitation devices to dislodge debris adhered to the ductwork, such that debris may be safely conveyed to vacuum collection devices. Cleaning methods must not damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork.

(4) HEPA vacuum duct surfaces.

(5) When possible, damp wipe metal duct surfaces with clean water or detergent solution. Do not wet fibrous glass thermal or acoustical insulation.

(6) Identify areas where there is evidence of damage to or uncleanable mold in duct insulation. The Contracting Officer will make the decision to discard the insulation, if necessary.

g. Final clearance of HVAC and duct system will be based on a visual assessment (no visible dust, no visible mold) by the IH. If HVAC fails final clearance inspection, additional corrective actions taken by the contractor must be at no additional cost to the Government.

## 3.6 FIRE PROTECTION

Provide portable fire extinguishers within the containment area and outside the decontamination unit. Fire extinguishers must be rated for the class of fire hazards in the work area and sized for coverage of the areas within the containment. At a minimum, one 4.5 kg ABC fire extinguisher for every 930 square meters must be strategically placed around the containment. Personnel must be trained for emergency egress and the use of fire extinguishers. Notify fire officials of work activities as required. IICRC S500

## 3.7 CONSTRUCTION BARRIERS

a. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure, element, adjacent facilities, or work to remain. Shoring, bracing or support necessary for structural wood studs or metal framing must be removed and replaced when they cannot be cleaned.

b. Do not disturb microbial-contaminated building materials while isolating work areas. This precaution prevents the release of microbial spores.

c. Workers must wear respirators and other PPE as outlined in the

microbial remediation plan when installing critical barriers where microbial contaminated surfaces (walls or surfaces with visible settled dusts) are likely to be disturbed. Operate an AFU if disturbance is likely during setup.

d. Monitor the air pressure differential across work area containments. The monitoring system must be in place before the start of remedial activities. Verification by the Industrial Hygienist is required prior to the start of the microbial remediation.

## 3.8 QUALITY ASSURANCE / QUALITY CONTROL REQUIREMENTS

### 3.8.1 Contractor Qualifications

Work must be performed by a qualified remediation contractor. Contractor must carry insurance that specifically covers mold remediation.

a. Remediation contractor's on-site supervisor. Submit documentation that the onsite supervisor is trained in microbial remediation with at least 3 years of experience in microbial remediation work. Qualified supervisor must be onsite whenever active remediation is being performed. Set-up activities may be performed without supervisor present; qualified supervisor must review set-up prior to start of work.

b. Mold remediation workers must be given training in PPE and mold remediation activities as required for their particular job. Microbial remediation plan must provide details of worker training.

### 3.8.2 Waste Management and Removal

Keep the site and work area free from accumulations of dust, waste materials, or rubbish caused by Contractor operations and free from any flammable materials or other sources of fire hazard. Remove all waste materials and rubbish from and about the work site in strict accordance with the specifications and applicable codes and regulations.

### 3.8.3 Post-Remediation Inspection

Clean up all debris and dust in interior spaces outside the work area resulting from the Contractor's remediation work.

After all visible accumulations of material and debris are removed from the containment, provide the Contracting Officer a 24-hour notice for a final clearance visual inspection. The Contracting Officer and Contractor's Industrial Hygienist must conduct a thorough visual inspection of the work area. If during this inspection any visible debris or microbial contamination are observed, the Contractor must re-clean the work area without additional cost to the Government.

#### 3.8.3.1 Clearance

a. Clearance Criteria

b. Clearance will be based on visual assessment (all visible mold removed, all visible dust removed, based on a "white glove" test) by the Contracting Officer. "White glove" test consists of wiping the surface with a clean cloth of color suitable to reveal expected type of dust. For most surfaces, a white cloth is suitable. For GWB dust,

a dark cloth may be more appropriate.

c. Failed remediation areas must be recleaned at no additional cost to the Government and the AFUs kept in operation another 12-hours, followed by another visual assessment. Subsequent failures must follow the same routine until a pass condition is secured.

## 3.9 CLEAN-UP AND DISPOSAL

### 3.9.1 Disposal of Material

Dispose of contaminated bagged waste materials removed during this remediation as general construction debris. Follow all applicable local, State, and Federal requirements for the disposal of this material.

### 3.9.2 Material Packaging

Place waste, as waste is removed, into a disposal container promptly. Disposal containers must consist of at a minimum, two layers of clear 0.15 millimeter polyethylene bags. Tape bags in a gooseneck fashion to form an airtight seal and label appropriately. Bag waste from vacuums equipped with HEPA filters in 0.15 millimeter polyethylene bags.

### 3.9.3 Building Exit (Waste Disposal)

HEPA vacuum and damp wipe bags of contaminated waste material prior to removal from the building. When possible pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster.

### 3.9.4 Hazardous Material

Should the Contractor encounter any hazardous materials, notify the Contracting Officer immediately for direction.

Separate hazardous waste from non-hazardous waste to be recycled or reclaimed to the greatest extent practicable and exclude hazardous waste from waste reduction calculations in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

## 3.10 BASIS OF MEASUREMENT AND PAYMENT

If mold or mold impacted materials are observed, the work required by the Government shall be paid for under allowance items in the Proposal Schedule. Payment shall be the actual cost as invoiced by the Contractor and approved by the Contracting Officer. The Contractor shall not be allowed to include overhead, profit, insurances and/or any other mark-ups which shall be considered incidental to and included in the lump sum price.

The Contractor shall provide unit prices for the listed items.

Removal and disposal of porus items

| | |
|---|---|
| Carpet | Y_____m2 |
| Gypsum Wallboard | Y_____m2 |
| Fiberglass Insulation | Y_____m2 |
| Ceiling Tile | Y_____m2 |

Removal and disposal of semi-porous items

| | |
|---|---|
| Concrete | Y_____m2 |
| Vinyl floor/wall coverings | Y_____m2 |
| Linoleum | Y_____m2 |
| Wood | Y_____m2 |

Removal and disposal of non-porous items

| | |
|---|---|
| Metal | Y_____m2 |
| Plastic | Y_____m2 |

Cleaning and disinfecting of surfaces

| | |
|---|---|
| Porous | Y_____m2 |
| Semi-porous | Y_____m2 |

Remediation/Monitoring

| | |
|---|---|
| Industrial Hygienist | Y_____daily rate |
| Certified Industrial Hygienist | Y_____daily rate |

## 3.11 APPENDICES

Appendix A - Microbial Assessment Visual Field Report Form

Appendix A

Microbial Assessment Visual Field Report Form

TO DOWNLOAD THIS FORM, SEE UFGS FORMS, GRAPHICS AND TABLES
Go to https://www.wbdg.org/dod/ufgs/forms-graphics-tables

-- End of Section --

**Section 02 85 00 Appendix A - Metric**

# Microbial Assessment Visual Field Report Form

**Building Number:** _____ **Date:** _____
**Building Type:** _____ **Assessment Team:** _____
**Floor/Level** _____ _____
_____ _____

| Room Number | Category | Air Sample(1) | Floor | Wall 1 | Wall 2 | Wall 3 | Wall 4 | Ceiling | Closet | HVAC | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Mold | Categories |
|---|---|
| I: | 0.093-0.93 square meters Mold impacted material |
| II: | 0.93-2.8 square meters Mold impacted material |
| III: | 2.8-9.3 square meters Mold impacted material |
| IV: | 9.3 square meters Mold impacted material or greater |

**3**
**Room Wall Numbering**
**2** will be clock-wise **4**
starting with
**Door wall** as **1**

**Inspector's Signature**: _____

Notes: 1. Air Samples denotes clearance samples to be taken {Yes} or { No}
Air Samples are not applicable if not required in Section 02 85 00.00 20

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# SECTION 03 30 53

# MISCELLANEOUS CAST-IN-PLACE CONCRETE
**05/14**

## PART 1 GENERAL

### 1.1 SUMMARY

Perform all work in accordance with JASS 5.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

| | |
|---|---|
| ACI 318 | (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14) |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C920 | (2018) Standard Specification for Elastomeric Joint Sealants |
| ASTM D1751 | (2018) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| COE CRD-C 513 | (1974) Corps of Engineers Specifications for Rubber Waterstops |
| COE CRD-C 572 | (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops |

JAPANESE ARCHITECTURAL STANDARD SPECIFICATIONS (JASS)

| | |
|---|---|
| JASS 5 | (2014) Reinforced Concrete Work |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1101 | (2020) Method of Test for Slump of Concrete |
| JIS A 1108 | (2018) Method of Test for Compressive Strength of Concrete |
| JIS A 1115 | (2020) Method of Sampling Fresh Concrete |

| | |
|---|---|
| JIS A 1128 | (2020) Method of Test for Air Content of Fresh Concrete by Pressure Method |
| JIS A 1132 | (2020) Method of Making and Curing Concrete Specimens |
| JIS A 1146 | (2017) Method of Test for Alkali-Silica Reactivity of Aggregates by Mortar-Bar Method |
| JIS A 1804 | (2009) Methods of Test for Production Control of Concrete--Method of Rapid Test for Identification of Alkali-Silica Reactivity of Aggregate |
| JIS A 5005 | (2020) Crushed Stone and Manufactured Sand for Concrete |
| JIS A 5308 | (2019) Ready-Mixed Concrete |
| JIS A 5758 | (2016) Sealants for Sealing and Glazing in Buildings |
| JIS A 6204 | (2011) Chemical Admixtures for Concrete |
| JIS G 3112 | (2020) Steel Bars for Concrete Reinforcement |
| JIS K 7129-2 | (2019) Plastics Film and Sheeting - Determination of Water Vapor Transmission Rate - Part 2: Infrared |
| JIS R 5210 | (2019) Portland Cement |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT-SS Chapter 6 | MLIT Architectural Standard Specifications, Chapter 6 Concrete |

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Air-Entraining Admixture
Curing Materials
Expansion Joint Filler Strips, Premolded
Joint Sealants - Field Molded Sealants

Waterstops
Conveying and Placing Concrete
Formwork
Mix Design Data; G
Ready-Mix Concrete
Curing Compound
Mechanical Reinforcing Bar Connectors

SD-06 Test Reports

Aggregates
Concrete Mixture Proportions; G
Compressive Strength Testing; G
Slump; G
Air Content
Water

SD-07 Certificates

Cementitious Materials
Aggregates
Delivery Tickets

SD-08 Manufacturer's Instructions

Curing Compound

## 1.4 QUALITY ASSURANCE

Indicate specific locations of Concrete Placement Forms Steel Reinforcement Accessories Expansion Joints Construction Joints Contraction Joints Control Joints on installation drawings and include, but not be limited to, square meters of concrete placements, thicknesses and widths, plan dimensions, and arrangement of cast-in-place concrete section.

# PART 2 PRODUCTS

## 2.1 SYSTEM DESCRIPTION

The Government retains the option to sample and test joint sealer, joint filler material, waterstop, aggregates and concrete to determine compliance with the specifications. Provide facilities and labor as may be necessary to assist the Government in procurement of representative test samples. Sample concrete in accordance with JIS A 1115. Determine slump and air content in accordance with JIS A 1101 and JIS A 1128, respectively, when cylinders are molded. Prepare, cure, and transport compression test specimens in accordance with JIS A 1132. Test compression test specimens in accordance with JIS A 1108. Take samples for strength tests not less than once each shift in which concrete is produced. Provide a minimum of five specimens from each sample; two to be tested at 28 days (90 days if pozzolan is used) for acceptance, two will be tested at 7 days for information and one held in reserve.

### 2.1.1 Strength

Acceptance test results are the average strengths of two specimens tested at 28 days (90 days if pozzolan is used). The strength of the concrete is considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive

strength, f'c, but not more than 20 percent, and no individual acceptance test result falls below f'c by more than 3.4 MPa.

### 2.1.2 Construction Tolerances

Apply a Class "C" finish to all surfaces except those specified to receive a Class "D" finish. Apply a Class "D" finish to all post-construction surfaces which will be permanently concealed. Surface requirements for the classes of finish required are as specified in JASS 5.

### 2.1.3 Concrete Mixture Proportions

Concrete mixture proportions are the responsibility of the Contractor. Mixture proportions must include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic meter of concrete. Provide materials included in the mixture proportions of the same type and from the same source as will be used on the project. For building components and related exterior electrical concrete structures, the specified compressive strength f'c is 21.0 MPa at 28 days. The maximum nominal size coarse aggregate is 20 mm, in accordance with JASS 5. The slump shall be between 150 and 180 mm. The maximum water-cementitious material ratio is 0.50. Concrete properties for site improvements and civil utilities shall be as provided in the respective specification sections and as shown on drawings. Submit the applicable test reports and mixture proportions that will produce concrete of the quality required, ten days prior to placement of concrete.

## 2.2 MATERIALS

Submit manufacturer's literature from suppliers which demonstrates compliance with applicable specifications for the specified materials.

### 2.2.1 Cementitious Materials

Submit Manufacturer's certificates of compliance, accompanied by mill test reports, attesting that the concrete materials meet the requirements of the specifications in accordance with the Special Clause "CERTIFICATES OF COMPLIANCE".

#### 2.2.1.1 Portland Cement

JIS R 5210, low alkali.

### 2.2.2 Aggregates

For fine and coarse aggregates meet the quality and grading requirements of JIS A 5005 and test and evaluate for alkali-aggregate reactivity in accordance with JIS A 1146 and JIS A 1804. Perform evaluation of fine and coarse aggregates separately. Submit certificates of compliance and test reports for aggregates showing the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

### 2.2.3 Admixtures

Provide admixtures, when required or approved, in compliance with the appropriate specification listed.

#### 2.2.3.1 Air-Entraining Admixture

Provide air-entraining admixture that meets the requirements of JIS A 6204.

### 2.2.4 Water

Mixing and curing water in compliance with the requirements of JIS A 5308; potable, and free of injurious amounts of oil, acid, salt, or alkali.

### 2.2.5 Reinforcing Steel

Provide reinforcing bars conforming to the requirements of JIS G 3112, SD295A for D16 or smaller bars, SD345 for D19 or larger bars, deformed. Detail reinforcement not indicated in accordance with JASS 5.Provide mechanical reinforcing bar connectors 125 percent minimum yield strength of the reinforcement bar.

### 2.2.6 Expansion Joint Filler Strips, Premolded

Expansion joint filler strips, premolded of sponge rubber conforming to ASTM D1751.

### 2.2.7 Joint Sealants - Field Molded Sealants

Conform to ASTM C920, Type M, Grade NS, Class 25 or JIS A 5758. Provide polyethylene tape, coated paper, metal foil, or similar type bond breaker materials. The backup material needs to be compressible, nonshrink, nonreactive with the sealant, and a nonabsorptive material such as extruded butyl or polychloroprene foam rubber. Immediately prior to installation of field-molded sealants, clean the joint of all debris and further cleaned using water, chemical solvents, or other means as recommended by the sealant manufacturer or directed.

### 2.2.8 Formwork

Design and engineer the formwork as well as its construction in accordance with JASS 5 and MLIT-SS Chapter 6. Fabricate of wood, steel, or other approved material. Submit formwork design prior to the first concrete placement.

### 2.2.9 Form Coatings

Provide form coating in accordance with JASS 5 and MLIT-SS Chapter 6.

### 2.2.10 Vapor Retarder and Vapor Barrier

Polyethylene sheeting, minimum 0.15 mm thickness or other equivalent material with a maximum permeance rating of 0.04 perms per JIS K 7129-2.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

### 2.2.11 Curing Materials

Provide curing materials in accordance with JASS 5 and MLIT-SS Chapter 6.

## 2.3 READY-MIX CONCRETE

Provide ready-mix concrete with mix design data conforming to JIS A 5308. Submit delivery tickets in accordance with JIS A 5308 for each ready-mix

concrete delivery, include the following additional information:

a. Type and brand cement

b. Cement content in 43 kilogram bags per cubic meter of concrete

c. Maximum size of aggregate

d. Amount and brand name of admixture

e. Total water content expressed by water cementitious material ratio

## 2.4 ACCESSORIES

### 2.4.1 Waterstops

#### 2.4.1.1 PVC Waterstop

Polyvinylchloride waterstops conforming to COE CRD-C 572.

#### 2.4.1.2 Rubber Waterstop

Rubber waterstops conforming to COE CRD-C 513.

### 2.4.2 Curing Compound

Provide curing compound conforming to JASS 5 and MLIT-SS Chapter 6. Submit manufactures instructions for placing curing compound.

### 2.4.3 Embedded Items

Use sleeves, inserts, anchors, and other embedded items of material and design indicated in Contract Documents.

# PART 3 EXECUTION

## 3.1 PREPARATION

Prepare construction joints to expose coarse aggregate. The surface must be clean, damp, and free of laitance. Construct ramps and walkways, as necessary, to allow safe and expeditious access for concrete and workmen. Remove standing or flowing water, loose particles, debris, and foreign matter. Satisfactorily compact earth foundations. Make spare vibrators available. Placement cannot begin until the entire preparation has been accepted by the Government.

### 3.1.1 Embedded Items

Secure reinforcement in place after joints, anchors, and other embedded items have been positioned. Arrange internal ties so that when the forms are removed the metal part of the tie is not less than 50 mm from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Prepare embedded items so they are be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. The embedding of wood in concrete is permitted only when specifically authorized or directed. Provide all equipment needed to place, consolidate, protect, and cure the concrete at the placement site and in good operating condition.

### 3.1.2 Formwork Installation

Forms must be properly aligned, adequately supported, and mortar-tight. Provide smooth form surfaces, free from irregularities, dents, sags, or holes when used for permanently exposed faces. Chamfer all exposed joints and edges, unless otherwise indicated.

### 3.1.3 Production of Concrete

#### 3.1.3.1 Ready-Mixed Concrete

Provide ready-mixed concrete conforming to JIS A 5308 except as otherwise specified.

### 3.1.4 Waterstops

Install and splice waterstops as directed by the manufacturer.

## 3.2 CONVEYING AND PLACING CONCRETE

Convey and place concrete in accordance with JASS 5 and MLIT-SS Chapter 6.

### 3.2.1 Cold-Weather Requirements

Place concrete in cold weather in accordance with JASS 5 and MLIT-SS Chapter 6.

### 3.2.2 Hot-Weather Requirements

Place concrete in hot weather in accordance with JASS 5 and MLIT-SS Chapter 6.

## 3.3 FINISHING

### 3.3.1 Temperature Requirement

Do not finish or repair concrete when either the concrete or the ambient temperature is below 10 degrees C.

### 3.3.2 Finishing Formed Surfaces

Remove all fins and loose materials , and surface defects including filling of tie holes. Repair all honeycomb areas and other defects. Remove all unsound concrete from areas to be repaired. Ream or chip surface defects greater than 13 mm in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete and fill with dry-pack mortar. Brush-coat the prepared area with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filling with mortar or concrete. Use a blend of portland cement and white cement in mortar or concrete for repairs to all surfaces permanently exposed to view shall be so that the final color when cured is the same as adjacent concrete.

### 3.3.3 Finishing Unformed Surfaces

Finish unformed surfaces in accordance with JASS 5 and MLIT-SS Chapter 6.

#### 3.3.3.1 Expansion and Contraction Joints

Make expansion and contraction joints in accordance with the details shown or as otherwise specified in Section 32 16 19 for sidewalks.

## 3.4 CURING AND PROTECTION

Cure and protect in accordance with JASS 5 and MLIT-SS Chapter 6.

## 3.5 FORM WORK

Provide form work in accordance with JASS 5 and MLIT-SS Chapter 6.

### 3.5.1 Removal of Forms

Remove forms in accordance with JASS 5 and MLIT-SS Chapter 6.

## 3.6 STEEL REINFORCING

Reinforcement must be free from loose, flaky rust and scale, and free from oil, grease, or other coating which might destroy or reduce the reinforcement's bond with the concrete.

### 3.6.1 Fabrication

Shop fabricate steel reinforcement in accordance with ACI 318 and JASS 5 and MLIT-SS Chapter 6. Provide shop details and bending in accordance with ACI 318 and JASS 5 and MLIT-SS Chapter 6.

### 3.6.2 Splicing

Perform splices in accordance with ACI 318 and JASS 5 and MLIT-SS Chapter 6.

### 3.6.3 Supports

Secure reinforcement in place by the use of metal or concrete supports, spacers, or ties.

## 3.7 EMBEDDED ITEMS

Before placing concrete, take care to determine that all embedded items are firmly and securely fastened in place. Provide embedded items free of oil and other foreign matter, such as loose coatings of rust, paint and scale. Embedding of wood in concrete is permitted only when specifically authorized or directed.

## 3.8 TESTING AND INSPECTING

Report the results of all tests and inspections conducted at the project site informally at the end of each shift. Submit written reports weekly. Deliver within three days after the end of each weekly reporting period.

### 3.8.1 Field Testing Technicians

The individuals who sample and test concrete must have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

### 3.8.2 Preparations for Placing

Inspect foundation or construction joints, forms, and embedded items in sufficient time prior to each concrete placement to certify that it is ready to receive concrete.

### 3.8.3 Sampling and Testing

a. Obtain samples and test concrete for quality control during placement. Sample fresh concrete for testing in accordance with JIS A 1115. Make six test cylinders.

b. Test concrete for compressive strength at 7 and 28 days for each design mix and for every 77 cubic meters of concrete. Test two cylinders at 7 days; two cylinders at 28 days; and hold two cylinders in reserve. Conform test specimens to JIS A 1132. Perform compressive strength testing conforming to JIS A 1108.

c. Test slump at the site of discharge for each design mix in accordance with JIS A 1101. Check slump once during each shift that concrete is produced for each strength of concrete required.

d. Test air content for air-entrained concrete in accordance with JIS A 1128. Check air content at least once during each shift that concrete is placed for each strength of concrete required.

### 3.8.4 Action Required

#### 3.8.4.1 Placing

Do not begin placement until the availability of an adequate number of acceptable vibrators, which are in working order and have competent operators, has been verified. Discontinue placing if any lift is inadequately consolidated.

#### 3.8.4.2 Air Content

Whenever an air content test result is outside the specification limits, adjust the dosage of the air-entrainment admixture prior to delivery of concrete to forms.

#### 3.8.4.3 Slump

Whenever a slump test result is outside the specification limits, adjust the batch weights of water and fine aggregate prior to delivery of concrete to the forms. Make the adjustments so that the water-cementitious material ratio does not exceed that specified in the submitted concrete mixture proportion and the required concrete strength is still met.

-- End of Section --

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SECTION 06 20 00

FINISH CARPENTRY
**08/16, CHG 2: 11/18**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Where relevant, acceptable alternative Japanese Standards are listed following its comparable American counterpart. Contractor may substitute comparable JIS/JASS standards for non-Japanese standards, as approved by the Contracting Officer's Representative.

AMERICAN FOREST FOUNDATION (AFF)

| | |
|---|---|
| ATFS STANDARDS | (2015) American Tree Farm System Standards of Sustainability 2015-2020 |

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

| | |
|---|---|
| ALSC PS 20 | (2015) American Softwood Lumber Standard |

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

| | |
|---|---|
| ASME B18.2.1 | (2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series) |
| ASME B18.2.2 | (2022) Nuts for General Applications: Machine Screw Nuts, and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series) |
| ASME B18.6.1 | (2016) Wood Screws (Inch Series) |

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

| | |
|---|---|
| AWPA M4 | (2021) Standard for the Care of Preservative-Treated Wood Products |
| AWPA U1 | (2022) Use Category System: User Specification for Treated Wood |

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

| | |
|---|---|
| APA L870 | (2010) Voluntary Product Standard, PS 1-09, Structural Plywood |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM D2898 | (2010; R 2017) Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing |

| | |
|---|---|
| ASTM F547 | (202) Standard Terminology of Nails for Use with Wood and Wood-Base Materials |

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

| | |
|---|---|
| ANSI/BHMA A156.9 | (2020) Cabinet Hardware |

COMPOSITE PANEL ASSOCIATION (CPA)

| | |
|---|---|
| CPA A208.1 | (2016) Particleboard |

CSA GROUP (CSA)

| | |
|---|---|
| CSA Z809-08 | (R2013) Sustainable Forest Management |

FOREST STEWARDSHIP COUNCIL (FSC)

| | |
|---|---|
| FSC STD 01 001 | (2015) Principles and Criteria for Forest Stewardship |

GREEN SEAL (GS)

| | |
|---|---|
| GS-36 | (2013) Adhesives for Commercial Use |

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

| | |
|---|---|
| NHLA Rules | (2015) Rules for the Measurement & Inspection of Hardwood & Cypress |

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

| | |
|---|---|
| NELMA Grading Rules | (2013) Standard Grading Rules for Northeastern Lumber |

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

| | |
|---|---|
| PEFC ST 2002:2013 | (2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements |

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

| | |
|---|---|
| RIS Grade Use | (1998) Redwood Lumber Grades and Uses |

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

| | |
|---|---|
| SCAQMD Rule 1168 | (2017) Adhesive and Sealant Applications |

SOUTHERN PINE INSPECTION BUREAU (SPIB)

| | |
|---|---|
| SPIB 1003 | (2014) Standard Grading Rules for Southern Pine Lumber |

SUSTAINABLE FOREST INITIATIVE (SFI)

| | |
|---|---|
| SFI 2015-2019 | (2015) Standards, Rules for Label Use, Procedures and Guidance |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 40 CFR 770 | Formaldehyde Standards for Composite Wood Products |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 2818 | (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings |

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

| | |
|---|---|
| WCLIB 17 | (2015) Standard Grading Rules |

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

| | |
|---|---|
| WWPA G-5 | (2017) Western Lumber Grading Rules |

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

| | |
|---|---|
| WDMA I.S.4 | (2015A) Preservative Treatment for Millwork |

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)

| | |
|---|---|
| WMMPA WM 6 | (2007) Quality Industry Standards Booklet |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings Indicating All Wood Assemblies; G

SD-03 Product Data

Wood Products; G

Treated Wood Products; G

Hardware and Accessories; G

Recycled Content for MDF/Particleboard; S

SD-04 Samples

Samples; G

SD-07 Certificates

Certificates of Grade; G

Certified Sustainably Harvested Softwood Plywood; S

Indoor Air Quality for MDF and Particleboard; S

Indoor Air Quality for Non-aerosol Adhesives; S

Indoor Air Quality for Aerosol Adhesives; S

## 1.3 DETAIL DRAWINGS

Submit detail drawings indicating all wood assemblies proposed for use in the project. Indicate materials, species, grade, density, grain, finish details of construction, location of use in the project, finishes, types, method and arrangement of fasteners, and installation details. This includes all fabricated assemblies.

## 1.4 PRODUCT DATA

Submit Manufacturers printed data including proposed species, grade, density grain, and finish as applicable; sufficient to demonstrate compliance with this specification for each type of wood product specified. For treated wood products also provide documentation of environmentally safe preservatives for each type of wood product specified.

Provide Manufacturers printed data for hardware and all wood accessories including but not limited to edge banding, adhesives, and sealers.

## 1.5 SAMPLES

Samples indicating proposed species, grade, density grain, and finish for each type of wood product specified. Provide samples of sufficient size to show pattern and color ranges of proposed products.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver wood products to the jobsite in an undamaged condition. Stack materials to ensure ventilation and drainage. Protect against dampness before and after delivery. Store materials under cover in a well ventilated enclosure and protect against extreme changes in temperature and humidity. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Do not store products in building until wet trade materials are dry and humidity of the space is within wood manufacturer's tolerance limits for storage.

## 1.7 QUALITY ASSURANCE

### 1.7.1 Certifications

#### 1.7.1.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

#### 1.7.1.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001, ATFS STANDARDS, CSA Z809-08, SFI 2015-2019, or other third party program certified by PEFC ST 2002:2013. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify

certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.7.1.3 Indoor Air Quality Certifications

1.7.1.3.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.7.1.3.2 Composite Wood Products

For purposes of this specification, composite wood products include hardwood plywood, particleboard, medium density fiberboard (MDF), panel substrates, and door cores. Provide products certified to meet requirements of both 40 CFR 770. Provide current product certification documentation from certification body.

1.7.2 Lumber

Identify each piece or each bundle of lumber, millwork, and trim by the grade mark of a recognized association or independent inspection agency certified by the Board of Review of the ALSC to grade the species.

1.7.3 Plywood

Provide each sheet of plywood with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. Marks must identify plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870.

1.7.4 Hardboard and Particleboard

Provide materials marks or written documentation identifying the producer and the applicable standard.

1.7.5 Pressure Treated Lumber and Plywood

Inspect each treated piece in accordance with AWPA U1.

1.7.6 Non-Pressure Treated Woodwork and Millwork

Mark, stamp, or label to indicate compliance with WDMA I.S.4.

1.7.7 Fire-Retardant Treated Lumber

Each piece must bear an Underwriters Laboratories fire resistance label or comparable label of another nationally recognized independent fire retardant materials testing laboratory.

# PART 2 PRODUCTS

## 2.1 WOOD PRODUCTS

### 2.1.1 Sizes and Patterns of Wood Products

Provide yard and board lumber sizes in accordance with ALSC PS 20. Provide shaped lumber and millwork in the patterns indicated and in standard patterns of the association covering the species. Size references, unless otherwise specified, are nominal sizes. Provide actual sizes within manufacturing tolerances allowed by the applicable standard.

### 2.1.2 Species and Grades

Provide in accordance with AWPA U1 Use Category System Tables unless otherwise specified herein.

### 2.1.3 Trim, Finish, and Frames

Provide species and grades listed in the table below for wood materials that must be painted. For materials that must be stained, have a natural, or a transparent finish, provide materials one grade higher than those listed in the table below. Provide trim, except window stools and aprons with hollow backs.

TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH

| Grading Rules | Species | Exterior and Interior Trim, Finish, and Frames |
|---|---|---|
| WWPA G-5 standard grading rules | Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, (Ponderosa Pine-Lodgepole Pine,) White Woods, (Western Woods,) Western Cedars, Western Hemlock | All Species: C & BTR. Select (Choice & BTR Idaho White Pine) or Superior Finish. Western Red Cedar may be graded C & BTR. Select or A & BTR in accordance with Special Western Red Cedar Rules. |
| WCLIB 17 standard grading rules | Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock | All Species: C & BTR VG, except A for Western Red Cedar |

| TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH | | |
|---|---|---|
| Grading Rules | Species | Exterior and Interior Trim, Finish, and Frames |
| SPIB 1003 standard grading rules | Southern Pine | C & BTR |
| NHLA Rules | Cypress | C-Select |
| NELMA Grading Rules standard grading rules ** | Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine, Northern White Cedar | All Species: C-Select except C & BTR for Eastern White Pine and Norway Pine |
| RIS Grade Use standard specifications | Redwood | Clear, Clear All Heart |
| NHLA Rules | Cypress | B Finish |
| | Red Gum, Soft Elm, Birch | Select or BTR (for interior use only) |

Note: ** http://www.nelma.org/library/2013-standard-grading-rules-for-northeastern-lumber/

2.1.4 Utility Shelving

Provide utility shelving in a suitable species equal to or exceeding the requirements of No. 3 common white fir under WWPA G-5, 25 mm thick; or plywood, interior type, Grade A-B, 13 mm thick, any species group.

2.1.5 Softwood Plywood

Provide in accordance with APA L870. Provide certified sustainably harvested softwood plywood. When located on the interior of buildings, provide products with no added urea-formaldehyde resins.

b. Plywood for Shelving: Interior type, A-B Grade, any species group.

2.1.6 Medium Density Fiberboard (MDF) and Particleboard

CPA A208.1, Grade 1-M-2 or 2-M-2 or better. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for MDF and particleboard.

Provide products with 80 percent total recovered materials content. Provide data identifying percentage of recycled content for MDF/particleboard.

## 2.2 MOISTURE CONTENT OF WOOD PRODUCTS

Air dry or kiln dry lumber. Kiln dry treated lumber after treatment. Maximum moisture content of wood products at time of delivery to the jobsite, and when installed, must be as follows:

a. Interior Paneling: 6 percent.

b. Interior Finish Lumber, Trim, and Millwork: 25 mm or Less in Thickness: 6 percent on 85 percent of the pieces and 8 percent on remainder.

c. Exterior Treated and Untreated Finish Lumber and Trim: 89 mm or Less in Thickness: 19 percent.

d. Exterior Wood Siding: 15 percent.

e. Provide moisture content of other materials in accordance with the applicable standards.

## 2.3 PRESERVATIVE TREATMENT OF WOOD PRODUCTS

### 2.3.1 Non-Pressure Treatment

Treat woodwork and millwork in accordance with WDMA I.S.4, with either 2 percent copper napthenate, 3 percent zinc napthenate, or 1.8 percent copper-8-quinolinolate. Provide a liberal brush coat of preservative treatment to field cuts and holes.

### 2.3.2 Pressure Treatment

Treat lumber and plywood used on the exterior of buildings or in contact with masonry or concrete with a waterborne preservative listed in AWPA U1 (P series is included therein by reference) as applicable, and inspected in accordance with AWPA U1. Identify treatment on each piece of material by the quality mark of an agency accredited by the Board of Review of the American Lumber Standards Committee. Provide treated plywood to a reflection level as follows:

Preservative treat exterior wood moulding and millwork that will be within 455 mm of soil or in contact with water or concrete in accordance with WMMPA WM 6. Provide a field treatment in accordance with AWPA M4 of exposed areas of treated wood that have been cut or drilled. Items of all-heart material of cedar, cypress, or redwood do not require preservative treatment except when in direct contact with soil.

## 2.4 FIRE-RETARDANT TREATMENT

### 2.4.1 Wood Products

Pressure treat fire-retardant treated lumber and plywood in accordance with AWPA U1. Comply with material use as defined in AWPA U1 for Interior Type A and B and Exterior Type. Treatment and performance inspection must be conducted by a qualified independent testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance with such rating. Subject treated materials that will be exposed to rain wetting to an accelerated weathering technique in accordance with ASTM D2898, Method A, prior to being tested for compliance with AWPA U1.

## 2.5 HARDWARE AND ACCESSORIES

Provide sizes, types, and spacings of hardware and accessories as recommended in writing by the wood product manufacturer, except as otherwise specified.

### 2.5.1 Wood Screws

ASME B18.6.1.

### 2.5.2 Bolts, Nuts, Lag Screws, and Studs

ASME B18.2.1 and ASME B18.2.2.

### 2.5.3 Nails

Use nails of a size and type best suited for each application and in accordance with ASTM F547. Use hot-dipped galvanized or aluminum nails for exterior applications. For siding, provide nails of sufficient length to extend 40 mm into supports, including wood sheathing over framing. Where nailing is impractical, provide screws of a size and type best suited for each application.

### 2.5.4 Adjustable Shelf Standards

ANSI/BHMA A156.9, Type B0491, with shelf rests Type B0483.

### 2.5.5 Vertical Slotted Shelf Standards

ANSI/BHMA A156.9, Type B04101 and 3, with shelf brackets Type B0412 and 3.

### 2.5.6 Closet Hanger Rods

Chromium plated steel rods, not less than 25 mm diameter by 1.3 mm thick. Rods may be adjustable with integral mounting brackets if smaller tube is 25 mm by 1.3 mm thick. Provide intermediate support brackets for rods more than 1200 mm long.

## 2.6 FABRICATION

### 2.6.1 Quality Standards (QS)

#### 2.6.1.1 Grades

The terms "Premium," "Custom," and "Economy" refer to the quality grades defined in NAAWS 3.1. Provide items not otherwise specified in a specific grade as "Custom" grade.

#### 2.6.1.2 Adhesives

Select adhesives for durability and permanent bonding. Address factors such as materials that must be bonded, expansion and contraction, bond strength, fire rating, moisture resistance, and manufacturer's recommendations.

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of VOC content requirements of SCAQMD Rule 1168. Provide

aerosol adhesives used on the interior of the building meeting either emissions requirements of VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building.

### 2.6.2 Workbenches

Dovetail and glue drawer corners. Fasten frames with suitable wood screws or bolts. Sand exposed surfaces smooth, and ease exposed edges. Provide two side mounted, metal, ball bearing drawer slides for each drawer, and at least two surface mounted hinges and a magnetic catch for each door.

## PART 3 EXECUTION

Do not install building construction materials that show visual evidence of biological growth.

## 3.1 FINISH WORK

Apply primer to finish work before installing. Where practicable, shop assemble and finish millwork items. Construct joints tight and in a manner to conceal shrinkage but to avoid cupping, twisting and warping after installation. Miter trim and mouldings at exterior angles; cope at interior angles and at returns. Provide millwork and trim in maximum practical lengths. Fasten finish work with finish nails. Provide blind nailing where practicable. Set face nails for putty stopping.

### 3.1.1 Exterior Finish Work

Machine sand exposed flat members and square edges. Machine finish semi-exposed surfaces. Construct joints to exclude water. In addition to nailing, glue joints with waterproof glue as necessary for weather resistant construction. Evenly distribute end joints in built-up members. Provide shoulder joints in flat work. Reinforce backs of wide-faced miters with metal rings and waterproof glue. Unless otherwise indicated, provide fascia and other flat members 19 mm thick minimum. Provide door and window trim in single lengths. Provide braced, blocked, and rigidly anchored cornices for support and protection of vertical joints. Provide soffits in largest practical size. Align joints of plywood over centerlines of supports. Fasten soffits with aluminum or stainless steel nails. Back prime all concealed surfaces of exterior trim.

### 3.1.2 Interior Finish Work

After installation, sand exposed surfaces smooth. Provide window and door trim in single lengths.

## 3.2 SHELVING

Support 25 mm nominal thick wood shelf material or 19 or 20 mm thick plywood shelf material with end and intermediate supports arranged to prevent buckling and sagging. Provide cleats except where hook strips are specified or indicated. Where adjustable shelving is indicated, provide standards and brackets or shelf rests for each shelf. Anchor standards to wall at not more than 600 mm on center.

### 3.2.1 Linen Closets

Unless indicated otherwise, provide linen closets with a counter shelf 500 mm wide located 900 mm above the floor, a lower shelf approximately 450 mm wide and 450 mm above the floor, and three upper shelves 285 mm wide located 350 mm above the counter shelf and 350 mm apart.

### 3.2.2 Storage Rooms

Unless otherwise indicated, provide storage rooms with shelves 285 mm wide, bottom shelf 450 mm above the floor, top shelf 450 mm below the ceiling, and intermediate shelves approximately 450 mm apart.

### 3.2.3 Room Closets

Provide two shelves 285 mm wide. Support lower shelf by hook strips at back and ends, and provide full length wood or metal clothes hanger rods unless indicated otherwise.

### 3.2.4 Cleaning Gear Closets

Provide shelves of size and arrangement indicated .

## 3.3 CLOTHES HANGER RODS

Provide clothes hanger rods where indicated and in closets having hook strips. Set rods parallel with front edges of shelves and support by sockets at each end and intermediate brackets spaced not more than 1200 mm on center.

## 3.4 MISCELLANEOUS

### 3.4.1 Workbenches

Provide level, plumb, and tight to adjacent construction. Fasten workbenches to walls with screws or toggle bolts and to floors with expansion bolts.

-- End of Section --

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DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

SECTION 06 61 16

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**08/20**

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# SECTION 06 61 16

# SOLID SURFACING FABRICATIONS
**08/20**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C920 | (2018) Standard Specification for Elastomeric Joint Sealants |
| ASTM D570 | (1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics |
| ASTM D638 | (2014) Standard Test Method for Tensile Properties of Plastics |
| ASTM D696 | (2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer |
| ASTM D790 | (2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials |
| ASTM D2583 | (2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor |
| ASTM E84 | (2020) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM G21 | (2015; R 2021; E 2021) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi |

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

| | |
|---|---|
| CDPH SECTION 01350 | (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers |

INTERNATIONAL CAST POLYMER ASSOCIATION (ICPA)

| | |
|---|---|
| ICPA SS-1 | (2001) Performance Standard for Solid Surface Materials |

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

| | |
|---|---|
| ANSI/NEMA LD 3 | (2005) Standard for High-Pressure Decorative Laminates |

NSF INTERNATIONAL (NSF)

| | |
|---|---|
| NSF/ANSI 51 | (2021) Food Equipment Materials |

## 1.2 SYSTEM DESCRIPTION

a. Work under this section includes countertops and other items utilizing solid surfacing material fabrications as indicated on the drawings and as described in this specification. Do not change source of supply for materials after work has started, if the appearance of finished work would be affected.

b. In most instances, installation of solid surfacing material fabricated components and assemblies requires strong correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid surfacing material fabricator/installer and other trades to ensure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, counter tops, shelving, and all other solid surfacing material fabrications to the degree and extent recommended by the solid surfacing material manufacturer.

c. Provide appropriate staging areas for solid surfacing material fabrications. Allow variation in component size and location of openings of plus or minus 3 mm.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Fabrication Drawings; G

Installation; G

SD-03 Product Data

Solid Polymer; G

Indoor air quality for solid surface seam and sealant products; S

SD-04 Samples

Material; G

Counter Tops; G

SD-06 Test Reports

Test Report Results

SD-07 Certificates

Qualifications

Indoor Air Quality for solid surface fabrication products; S

SD-10 Operation and Maintenance Data

Solid Polymer, Data Package 1; G

## 1.4 QUALITY ASSURANCE

### 1.4.1 Qualifications

To ensure warranty coverage, provide manufacturer certified solid surfacing fabricators to fabricate the solid surfacing material being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Minimum of 5 years of experience working with solid surfacing materials is required of fabricators. Submit solid surfacing material manufacturer's certification attesting to fabricator qualification approval.

### 1.4.2 Mock-ups

Submit Detail Fabrication Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work. Prior to final approval of shop drawings, provide a full-size mock-up of a typical counter top where multiple units are required. Include all solid surfacing material components required to provide a completed unit. Utilize finishes in patterns and colors as indicated in the drawings; colors listed are not intended to limit the selection of equal colors from other manufacturers. in the mock-up. Should the mock-up not be approved, re-work or remake it until approval is secured. Remove rejected units from the jobsite. Approved mock-up may remain as part of the finished work.

## 1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Store materials indoors and take adequate precautions to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

## 1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of 10 years from date of final acceptance of the work.

# PART 2 PRODUCTS

## 2.1 MATERIAL

Submit detail fabrication drawings and installation drawings of each solid surfacing fabrication indicated. Include elevations, dimensions, clearances, details of construction and anchorage, and details of joints and connections.

Submit manufacturers' descriptive product data for solid polymer fabrication indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for solid polymer fabrication in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

### 2.1.1 Solid Surfacing Material

Provide solid polymer that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction, complying with ICPA SS-1. Provide material that meets or exceeds the minimum physical and performance properties specified. Superficial damage to a depth of 0.25 mm must be repairable by sanding or polishing. Material thickness is as indicated on the drawings; required minimum thickness is 6 mm. Submit a minimum 102 by 102 mm sample of each color and pattern for approval; include full range of color and pattern variation. Retain approved samples as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid surfacing materials meet or exceed each of the specified performance requirements.

a. Horizontal Surfaces: 19 mm thick material

b. Vertical Surfaces: 13 mm thick material

c. Provide materials that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of indoor air quality for solid surface fabrication products.

### 2.1.2 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material composed of acrylic polymer, mineral fillers, and pigments. Provide acrylic polymer that meets or exceeds the following minimum performance requirements:

| PROPERTY | REQUIREMENT (min. or max.) | TEST PROCEDURE |
|---|---|---|
| Tensile Strength | 291 $kg/cm^2$ (max.) | ASTM D638 |
| Hardness | 55-Barcol Impressor (min.) | ASTM D2583 |

| PROPERTY | REQUIREMENT (min. or max.) | TEST PROCEDURE |
|---|---|---|
| Thermal Expansion | .0000386cm/cm/deg C (max.) | ASTM D696 |
| Boiling Water Surface Resistance | No Change | ANSI/NEMA LD 3-3.05 |
| High Temperature Resistance | No Change | ANSI/NEMA LD 3-3.06 |
| Impact Resistance (Ball drop) | | ANSI/NEMA LD 3-303 |
| 6 mm sheet | 914 mm, 227 g ball, no failure | |
| 13 mm sheet | 3556 mm, 227 g ball, no failure | |
| 19 mm sheet | 5080 mm, 227 g ball, no failure | |
| Mold & Mildew Growth | No growth | ASTM G21 |
| Bacteria Growth | No growth | ASTM G21 |
| Liquid Absorption (Weight in 24 hrs.) | 0.1 percent max. | ASTM D570 |
| Flammability | | ASTM E84 |
| Flame Spread | 25 max. | |
| Smoke Developed | 30 max. | |
| Sanitation | "Food Contact" approval | NSF/ANSI 51 |
| Flexural Strength | 6,800 psi (min.) | ASTM D790 |

### 2.1.3 Material Patterns and Colors

Provide pattern and color for all solid surfacing material components and fabrications as indicated in the drawings; colors listed are not intended to limit the selection of equal colors from other manufacturers. Provide products with consistent patterned color throughout thickness of the product.

### 2.1.4 Surface Finish

Provide a uniform appearance on exposed finished surfaces and edges. Exposed surface finish is as indicated.

## 2.2 ACCESSORY PRODUCTS

Provide accessory products, as specified below, as manufactured by the solid surfacing material manufacturer or as approved by the solid surfacing material manufacturer for use with the solid surfacing materials

being specified.

### 2.2.1 Adhesives

Provide a two-part seam adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid surfacing materials and components to create a monolithic appearance of the fabrication. Provide adhesive approved by the solid surfacing material manufacturer. Color-match adhesive to the surfaces being bonded where solid-colored, solid surfacing materials are being bonded together. Provide clear or color matched seam adhesive where particulate patterned, solid surfacing materials are being bonded together.

### 2.2.2 Seam and Sealant Emissions

Provide seam and other accessory materials that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide validation of indoor air quality for solid surface seam and sealant products.

### 2.2.3 Silicone Sealant

Provide silicone sealant, mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, acid-curing; ASTM C920, Type S, Grade NS, Class 25, Use NT; clear formulation; approved for use by the solid surfacing material manufacturer.

### 2.2.4 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

## 2.3 FABRICATIONS

Provide factory or shop fabricate components to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii must be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid surfacing material, joint adhesive, sealants, and heat reflective tape.

### 2.3.1 Joints and Seams

Form joints and seams between solid surfacing material components using manufacturer's approved seam adhesive. Provide inconspicuous joints in appearance without voids to create a monolithic appearance.

### 2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Provide edge shapes and treatments, including any inserts, as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter Top Splashes

Fabricate backsplashes and end splashes from 13 mm thick solid surfacing material to be in conformance with dimensions and shapes as indicated. Provide backsplashes and end splashes at locations indicated. Shop fabricate backsplashes and provide permanently attached .

2.3.3.1 End Splashes

Provide end splashes loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Counter Tops

Fabricate all solid surfacing material, counter top components from 19 mm thick material. Indicate details, dimensions, locations, and quantities on the drawings. Provide counter tops with100mm high permanently attached with coved transition backsplash and loose endsplashes as indicated. Attach 51 mm wide reinforcing strip of solid surfacing material under each horizontal counter top seam. Submit a minimum 305 mm wide by 152 mm deep, full size sample for each type of counter top shown on the project drawings; include the edge profile and backsplash as detailed on the drawings and at least one seam. Retain approved sample as standard for this work. Provide square edge profile.

2.3.4.1 Counter Tops with Sinks

a. Provide stainless steel or vitreous china sink; include cutouts to template for counter tops with sinks as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for stainless steel and vitreous chinainstallation. Seal between sink and counter top with specified silicone sealant. Provide sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between solid surfacing material components using solid surfacing material manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal or vitreous china sinks and lavatory bowls to counter tops using solid surfacing material manufacturer's recommended clear silicone sealant and mounting hardware. Install solid polymer sinks and bowls using a color-matched seam adhesive.

3.1.1.1 Loose Counter Top Splashes

Mount loose splashes in the locations noted on the drawings. Adhere loose splashes to the counter top with a color matched silicone sealant when the solid surfacing material components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid surfacing material splashes to counter tops.

### 3.1.2 Silicone Sealant

Use specified silicone sealant to seal all expansion joints between solid surfacing material components and all joints between solid surfacing material components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Provide sealant bead smooth and uniform in appearance and minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Provide continuous bead and run the entire length of the joint being sealed.

### 3.1.3 Plumbing

Make plumbing connections to sinks and lavatories in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE .

## 3.2 CLEAN-UP

Components must be cleaned after installation and covered to protect against damage during completion of the remaining project items. Damaged components must be repaired or replaced at the Contractor's sole expense.

-- End of Section --

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# SECTION 07 14 00

# FLUID-APPLIED WATERPROOFING
**02/12**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE ARCHITECTURAL STANDARD SPECIFICATIONS (JASS)

| | |
|---|---|
| JASS 8 | Waterproofing Work Standard Specification |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 6013 | (2014) Polymer-Modified Bitumen Roofing Sheets |
| JIS A 6021 | (2011) Liquid-applied Compounds for Waterproofing Membrane Coatings of Buildings |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 9 | (2019) Building Construction Standard Specifications - Chapter 9 Waterproofing Construction |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fluid-Applied Membrane

Membrane Primer

Bond Breaker

Submit material description and physical properties, application details, and recommendations regarding shelf life, application procedures, and precautions on flammability and toxicity.

SD-11 Closeout Submittals

Warranty

Information Card

Instructions To Government Personnel

Include copies of Safety Data Sheets for maintenance/repair materials.

## 1.3 PREWATERPROOFING CONFERENCE

Prior to starting application of waterproofing system, arrange and attend a prewaterproofing conference to ensure a clear understanding of drawings and specifications. Give the Contracting Officer 7 days advance written notice of the time and place of meeting. Ensure that the mechanical and electrical subcontractor, flashing and sheetmetal subcontractor, and other trades that may perform other types of work on or over the membrane after installation, attend this conference.

## 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver waterproofing materials in manufacturer's original, unopened containers, with labels intact and legible. Containers of materials covered by a referenced specification number shall bear the specification number, type, and class of the contents. Deliver materials in sufficient quantity to continue work without interruption. Store and protect materials in accordance with manufacturer's instructions, and use within their indicated shelf life. When hazardous materials are involved, adhere to special precautions of the manufacturer, unless precautions conflict with local, state, and federal regulations. Promptly remove from the site materials or incomplete work adversely affected by exposure to moisture or freezing. Store materials on pallets and cover from top to bottom with canvas tarpaulins.

## 1.5 ENVIRONMENTAL CONDITIONS

Apply materials when ambient temperature is 4 degrees C or above for a period of 24 hours prior to the application and when there is no ice, frost, surface moisture, or visible dampness on the substrate surface. Apply materials when air temperature is expected to remain above 4 degrees C during the cure period recommended by the manufacturer. Moisture test for substrate is specified under paragraph entitled "Moisture Test." Work may be performed within heated enclosures, provided the surface temperature of the substrate is maintained at a minimum of 4 degrees C for 24 hours prior to the application of the waterproofing, and remains above that temperature during the cure period recommended by the manufacturer.

## 1.6 WARRANTY

Provide roof system material and workmanship warranties meeting specified requirements. Provide revisions or amendment to standard membrane manufacturer warranty to comply with the specified requirements. Minimum manufacturer warranty shall have no dollar limit, cover full system water-tightness, and shall have a minimum duration of 10 years.

### 1.6.1 Roof Membrane Manufacturer Warranty

Furnish the roof membrane manufacturer's 10-year no dollar limit roof system materials and installation workmanship warranty, including flashing, insulation, and accessories necessary for a watertight roof

system construction. Write the warranty directly to the Government commencing at time of Government's acceptance of the roof work. Provide the the following statements for such warranty:

a. If within the warranty period the roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, blisters, splits, tears, cracks, delaminates, separates at the seams, or shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the roof system assembly and correction of defective workmanship are the responsibility of the roof membrane manufacturer. All cost associated with the repair or replacement work are the responsibility of the roof membrane manufacturer.

b. The warranty must remain in full force and effect, including emergency temporary repairs performed by others, when the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification.

### 1.6.2 Roofing System Installer Warranty

The roof system installer must warrant for a minimum period of two years that the roof system, as installed, is free from defects in installation workmanship, to include the roof membrane, flashing, insulation, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Write the warranty directly to the Government. The roof system installer is responsible for correction of defective workmanship and replacement of damaged or affected materials. The roof system installer is responsible for all costs associated with the repair or replacement work.

### 1.6.3 Continuance of Warranty

Approve repair or replacement work that becomes necessary within the warranty period and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the roof membrane manufacturer warranty for the remainder of the manufacturer warranty period.

## 1.7 CONFORMANCE AND COMPATIBILITY

Work not specifically addressed and any deviation from specified requirements must be in general accordance with recommendations of the MLIT SS Chapter 9, membrane manufacturer published recommendations and details, and compatible with surrounding components and construction.

# PART 2 PRODUCTS

## 2.1 FLUID-APPLIED MEMBRANE

JIS A 6021 and comply with JASS 8.

Two component reaction type acruylic rubber roof waterproofing system.

First layer of fluid applied waterproofing membrane as recommended by fluid applied waterproofing manufacturer for embedding the reinforcing mesh. To be applied to the reinforced primer.

econd layer of fluid applied waterproofing roof membrane.

Top layer of the fluid applied waterproofing memebrane. This layer shall be deeigned to be left exposed and to maximize solar reflectance. White finish color to be selected from manufacturer's standard finish colors.

## 2.2 MEMBRANE PRIMER

As recommended by the fluid-applied membrane manufacturer unless specifically prohibited by the manufacturer of the fluid-applied membrane.

Provide reinforced primer as recommended by manufacturer of the fluid applied memebrane for the substrate material.

## 2.3 REINFORCING MESH

As recommended by the fluid applied membrane manufactuerer for installation an exposed adhesion method on the the new concrete substrate for embedding in the first fluid applied membrane coat.

## 2.4 SEALANT

As specified in Section 07 92 00 JOINT SEALANTS.

## 2.5 SEALANT PRIMER

As specified in Section 07 92 00 JOINT SEALANTS.

## 2.6 BACKING MATERIAL

Premolded, closed-cell, polyethylene, or polyurethane foam rod having a diameter 25 percent larger than joint width before being compressed into joint. Provide bond breaker of polyethylene film or other suitable material between backing material and sealant.

## 2.7 JOINT FILLER

As specified in Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE.

## 2.8 BOND BREAKER

As recommended by the fluid-applied membrane manufacturer. Bond breaker shall not interfere with the curing process or other performance properties of the fluid-applied membrane.

## 2.9 ELASTOMERIC SHEET

Preformed; as recommended by the fluid-applied membrane manufacturer. Bond strength between the fluid-applied membrane and the preformed elastomeric sheet shall be a minimum of 7 kPa when tested in accordance with JIS A 6013.

## 2.10 ELASTOMERIC SHEET ADHESIVE

As recommended by the elastomeric sheet manufacturer.

# PART 3 EXECUTION

## 3.1 PREPARATION

Coordinate work with that of other trades to ensure that components to be incorporated into the waterproofing system are available when needed. Inspect and approve surfaces immediately before application of waterproofing materials. Remove laitance, loose aggregate, sharp projections, grease, oil, dirt, curing compounds, and other contaminants which could adversely affect the complete bonding of the fluid-applied membrane to the concrete surface.

### 3.1.1 Flashings

Make penetrations through sleeves in concrete slab watertight before application of waterproofing. After flashing is completed, cover elastomeric sheet with fluid-applied waterproofing during waterproofing application.

#### 3.1.1.1 Drains

Make drain flanges flush with surface of structural slab. Apply a full elastomeric sheet around the drain, with edges fully adhered to drain flange and to structural slab. Do not adhere elastomeric sheet over joint between drain and concrete slab. Do not plug drainage or weep holes. Cover elastomeric sheet with fluid-applied waterproofing during waterproofing application. Lap elastomeric sheet a minimum of 100 mm onto concrete slab.

#### 3.1.1.2 Penetrations and Projections

Flash penetrations and projections through structural slab with an elastomeric sheet adhered to the concrete slab and the penetration. Leave elastomeric sheet unadhered for 25 mm over joint between penetration and concrete slab. Adhere elastomeric sheet a minimum of 100 mm onto horizontal deck.

#### 3.1.1.3 Walls and Vertical Surfaces

Flash wall intersections which are not of monolithic pour or constructed with reinforced concrete joints with an elastomeric sheet adhered to both vertical wall surfaces and concrete slab. Flash intersections which are monolithically poured or constructed with reinforced concrete joints with either an elastomeric sheet or a vertical grade of fluid-applied waterproofing adhered to vertical wall surfaces and concrete slab. Leave sheet unadhered for a distance of 25 mm from the corner on both vertical and horizontal surfaces.

### 3.1.2 Cracks and Joints

Prepare visible cracks and joints in substrate to receive fluid-applied waterproofing membrane by placing a bond breaker and an elastomeric slip sheet between membrane and substrate. Cracks that show movement shall receive a 50 mm bond breaker followed by an elastomeric sheet adhered to the deck. Nonmoving cracks shall be double coated with fluid-applied waterproofing.

### 3.1.3 Priming

Prime surfaces to receive fluid-applied waterproofing membrane. Apply reinforced primer as required by membrane manufacturer's printed instructions.

## 3.2 SPECIAL PRECAUTIONS

Protect waterproofing materials during transport and application. Do not dilute primers and other materials, unless specifically recommended by materials manufacturer. Keep containers closed except when removing contents. Do not mix remains of unlike materials. Thoroughly remove residual materials before using application equipment for mixing and transporting materials. Do not permit equipment on the project site that has residue of materials used on previous projects. Use cleaners only for cleaning, not for thinning primers or membrane materials. Ensure that workers and others who walk on cured membrane wear clean, soft-soled shoes to avoid damaging the waterproofing materials.

## 3.3 APPLICATION

Over primed surfaces, provide a uniform, wet, monolithic coating of fluid-applied membrane, 1.5 mm thick, plus or minus 0.125 mm by following manufacturer's printed instructions. Apply material by trowel, squeegee, roller, brush, spray apparatus, or other method recommended by membrane manufacturer. Check wet film thickness as specified in paragraph entitled "Film Thickness" and adjust application rate as necessary to provide a uniform coating of the thickness specified. Where possible, mark off surface to be coated in equal units to facilitate proper coverage. Embed reinforcing mesh in first layer of fluid applied waterproofin. Apply second layer of fluid applied waterproofing membrane in accorance with manufacturer's recommendations. Apply colored top layer of fluid applied membrane waterproofing in accordance with manufacturer's recommendations. At expansion joints, control joints, prepared cracks, flashing, and terminations, carry membrane over preformed elastomeric sheet in a uniform 1.5 mm thick, plus or minus 0.125 mm, wet thickness to provide a monolithic coating. If membrane cures before next application, wipe previously applied membrane with a solvent to remove dirt and dust that could inhibit adhesion of overlapping membrane coat. Use solvent recommended by the membrane manufacturer, as approved.

## 3.4 FIELD QUALITY CONTROL

### 3.4.1 Moisture Test

Prior to application of fluid-applied waterproofing, measure moisture content of substrate with a moisture meter in the presence of the Contracting Officer. Do not begin application until meter reading indicates "dry" range.

### 3.4.2 Film Thickness

Measure wet film thickness every 10 square meters during application by placing flat metal plates on the substrate or using a mil-thickness gage especially manufactured for the purpose.

### 3.4.3 Flood Test

After application and curing is complete, plug drains and fill

waterproofed area with water to a depth of 50 mm. A minimum 48 hour cure time, or longer cure time if recommended by the membrane manufacturer, shall be required prior to flood testing. Allow water to stand 24 hours. Test watertightness by measuring water level at beginning and end of the 24 hour period. If water level falls, drain water, allow installation to dry, and inspect. Make repairs or replace as required and repeat the test. Work shall not proceed before approval of repairs or replacement.

## 3.5 INSTRUCTIONS TO GOVERNMENT PERSONNEL

Furnish written and verbal instructions on proper maintenance procedures to designated Government personnel. Furnish instructions by a competent representative of the roof membrane manufacturer and include a minimum of 4 hours on maintenance and emergency repair of the membrane. Include a demonstration of membrane repair, and give sources of required special tools. Furnish information on safety requirements during maintenance and emergency repair operations.

## 3.6 INFORMATION CARD

For each roof application, furnish a minimum 215 mm information card for facility records and a card laminated in plastic and framed for interior display at roof access point, or a photoengraved 1 mm thick aluminum card for exterior display. Identify facility name and number; location; contract number; approximate roof area; detailed roof system description, including deck type, membrane, number of plies, method of application, manufacturer, insulation and cover board system and thickness; presence of tapered insulation for primary drainage, presence of vapor retarder; date of completion; installing contractor identification and contract information; membrane manufacturer warranty expiration, warranty reference number, and contact information. Install card at roof top or access location as directed by the Contracting Officer and provide a paper copy to the Contracting Officer.

| FORM 1 | |
|---|---|
| FLUID-APPLIED WATERPROOFING SYSTEM COMPONENTS | |
| 1. Contract Number | |
| 2. Date Work Completed | |
| 3. Project Specification Designation | |
| 4. Substrate Material | |
| 5. Slope of Substrate | |
| 6. Drains Type/Manufacturer | |
| 7. Waterproofing | |
| a. Membrane | |
| b. Sealant | |
| c. Elastomeric Sheet | |
| d. Materials Manufacturer(s) | |
| 8. Warranty | |
| a. Manufacturer warranty expiration | |
| b. Warranty reference number | |
| 9. Statement of Compliance or Exception | |
| Contractor's Signature | Date Signed |
| Inspector's Signature | Date Signed |

-- End of Section --

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION

**11/11, CHG 4: 08/18**

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION
**11/11, CHG 4: 08/18**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Where relevant, acceptable alternative Japanese Standards are listed following its comparable American counterpart. Contractor may substitute comparable JIS/JASS standards for non-Japanese standards, as approved by the Contracting Officer's Representative.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C665 | (2017) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing |
| ASTM C930 | (2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories |
| ASTM D3575 | (2020) Flexible Cellular Materials Made From Olefin Polymers |
| ASTM D5359 | (2015) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber |
| ASTM E84 | (2020) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E136 | (2019a) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C |

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

| | |
|---|---|
| CDPH SECTION 01350 | (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers |

GREEN SEAL (GS)

| | |
|---|---|
| GS-36 | (2013) Adhesives for Commercial Use |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 54 | (2021) National Fuel Gas Code |
| NFPA 70 | (2023) National Electrical Code |
| NFPA 211 | (2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances |

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

| | |
|---|---|
| SCS | SCS Global Services (SCS) Indoor Advantage |

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

| | |
|---|---|
| SCAQMD Rule 1168 | (2017) Adhesive and Sealant Applications |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910.134 | Respiratory Protection |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 2818 | (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation

Recycled Content for Insulation Materials;

Sill Sealer Insulation

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials;

Indoor Air Quality for Adhesives;

SD-08 Manufacturer's Instructions

Insulation

## 1.3 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package.

### 1.3.1 Insulation Products

Provide product certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification from certification body.

### 1.3.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

## 1.4 DELIVERY, STORAGE, AND HANDLING

### 1.4.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

### 1.4.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

## 1.5 SAFETY PRECAUTIONS

### 1.5.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

### 1.5.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

# PART 2 PRODUCTS

## 2.1 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings ; Class A, membrane-faced surface with a flame spread of 25 or less , except a flame spread rating of 25 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

2.1.1 Thermal Resistance Value (R-VALUE)

The R-Value must be as indicated on drawings.

2.1.2 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Fiberglass: 20 percent glass cullet complying with ASTM D5359

Provide data identifying percentage of recycled content for insulation materials.

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

2.1.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

Provide certification of indoor air quality for insulation materials.

2.2 SILL SEALER INSULATION

Provide polyethylene foam sill sealer 89 millimeters in width with the following characteristics:.

| Physical Properties | Test Method | Measurement |
|---|---|---|
| Nominal Thickness | ASTM D3575 | 4.76 mm |
| Compressive Strength | ASTM D3575 | 8.27 kPa |
| - Vertical Direction | Suffix D | |
| Tensile Strength | ASTM D3575 | 220 kPa |
| | Suffix T | |

2.3 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 for blocking around chimneys and heat producing devices.

2.4 ACCESSORIES

2.4.1 Adhesive

As recommended by the insulation manufacturer. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350

(use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

2.4.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.4.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 75 mm from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 600 mm above fixture.

c. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.

d. Gas Fired Appliances: Clearances as required in NFPA 54.

Blocking around flues and chimneys is not required when insulation blanket, including any attached vapor retarder, passed ASTM E136, in addition to meeting all other requirements stipulated in Part 2. Blocking is also not required if the chimneys are certified by the manufacturer for use in contact with insulating materials.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as

required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

3.3.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

3.3.1.5 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

3.3.1.6 Installation of Sill Sealer

Size sill sealer insulation and place insulation over top of masonry or concrete perimeter walls or concrete perimeter floor slab on grade. Fasten sill plate over insulation.

3.3.1.7 Access Panels and Doors

Affix blanket insulation to access panels greater than one square foot and access doors in insulated floors and ceilings. Use insulation with same R-Value as that for floor or ceiling. -- End of Section --

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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

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BUILDING AIR BARRIER SYSTEM

**08/19, CHG 1: 02/20**

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SECTION 07 27 10.00 10

BUILDING AIR BARRIER SYSTEM
**08/19, CHG 1: 02/20**

# PART 1 GENERAL

## 1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibity for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification. Test the assembled air barrier system to demonstrate that the building envelope is properly sealed and insulated. Passing the air barrier system leakage test and thermography test will result in system acceptance.

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM D4541 | (2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers |
| ASTM E96/E96M | (2021) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials |
| ASTM E2178 | (2021a) Standard Test Method for Air Permeance of Building Materials |
| ASTM E2357 | (2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1324 | (2017) Measuring Method of Water Vapor Permeance for Building Materials |
| JIS A 9511 | (2021) Performed Cellular Plastics Thermal Insulation Materials |
| JIS A 9526 | (2015) Spray Applied Rigid Polyurethane |

Foam for Thermal Insulation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 285 | (2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components |

## 1.3 DEFINITIONS

The following terms as they apply to this section:

### 1.3.1 Air Barrier Accessory

Products designated to maintain air tightness between air barrier materials, air barrier assemblies and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants, tapes, backer rods, transition membranes, fasteners, strapping, primers).

### 1.3.2 Air Barrier Assembly

The combination of air barrier materials and air barrier accessories that are designated and designed within the environmental separator to act as a continuous barrier to the movement of air through the environmental separator.

### 1.3.3 Air Barrier Component

Pre-manufactured elements such as windows, doors, dampers and service elements that are installed in the environmental separator.

### 1.3.4 Air Barrier Envelope

The combination of air barrier assemblies and air barrier components, connected by air barrier accessories that are designed to provide a continuous barrier to the movement of air through an environmental separator. There may be more than one air barrier envelope in a single building. Also known as Air Barrier System.

### 1.3.5 Air Barrier Material

A building material that is designed, tested and/or produced to provide the primary resistance to airflow through an air barrier assembly of a wall system.

### 1.3.6 Air Barrier System

Same as AIR BARRIER ENVELOPE.

### 1.3.7 Air Leakage Rate

The rate of airflow (L/s) driven through a unit surface area (sq. m) of an assembly or system by a unit static pressure difference (Pa) across the assembly. (example: 1.27 L/s-$m^2$ @ 75 Pa)

1.3.8 Air Leakage

The total airflow (L/s) driven through the air barrier system by a unit static pressure difference (Pa) across the air barrier envelope. (example: 3070 L/s @ 75 Pa)

1.3.9 Air Permeance

The tested rate of airflow (L/s) through a unit area (sq. m) of a material driven by unit static pressure difference (Pa) across the material (example: 0.02 L/s-$m^2$ @ 75 Pa) as established by ASTM E2178 or JIS A 1324.

1.3.10 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. Also known as the Control Layer.

1.3.11 Vapor Permeance

Vapor permeance is separated into three classes based on the water vapor permeance of a material as tested via ASTM E96/E96M or JIS A 9511

| | |
|---|---|
| Class I Vapor Barrier/Retarder | 0.1 perm or less |
| Class II Vapor Barrier/Retarder | 0.1 perm to 1.0 perm |
| Class III Vapor Barrier/Retarder | 1.0 perm to 10 perm |

1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE

Organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of or penetration of the air barrier system to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Air Barrier System Shop Drawings; G, Manufacturer produced warranted air barrier system

SD-03 Product Data

Air Barrier System Product Data; G

SD-04 Samples

Material Samples For Air Barrier System; G

SD-05 Design Data

Design Data And Calculations For The Air Barrier System; G, Manufacturer produced warranted air barrier system

SD-06 Test Reports

Design Review Report; G

Testing and Inspection; G

SD-07 Certificates

Air Barrier Inspector; G, RO

## 1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS

The building air barrier systems must meet the following leakage requirements. The allowable leakage rate and the maximum leakage are at a differential test pressure of 75 Pa.

| Air Barrier Envelope 1 | |
|---|---|
| Surface Area | Newly installed windows and doors in the exterior wall square meter |
| Architectural Only Test: | |
| Allowable leakage rate | 1.27 L/s per square meter |
| Maximum leakage | 7.3 m3/hm2 or 0.4 cfm/ft2 total L/s |
| Architectural Plus HVAC System Test:not applicable | |
| Allowable leakage rate | L/s per square meter |
| Maximum leakage | total L/s |

## 1.7 AIR BARRIER INSPECTOR

Employ a designated Air Barrier Inspector on this project. The Air Barrier Inspector performs a Design Review, oversees quality control testing specified in these specifications, performs quality control air barrier inspection as specified, interfaces with the designer and product manufacturer's representatives to assure all installation requirements are met, and verifies that the constructed work is in accordance with both the manufacturer's recommendations for products used, the content of this specification and other contract drawings or docouments. Qualification for the Air Barrier Inspector are as follows:

a. Training and certification as an Air Barrier Auditor from the Air Barrier Association of America (ABAA) or other third party air barrier

association.

b. Or, provide documentation in resume format that demonstrates that the individual proposed has the experience, knowledge, skills and abilities to fulfill the above stated duties as the air barrier inspector.

c. It is acceptable that this individual be employed by the firm who will be performing the building pressurization test or another independent third party entity, provided they meet the above requirements but shall not be a member of the installing contractor or firm.

Provide copies of Air Barrier Inspector qualifications 30 days after Notice to Proceed.

## 1.8 DESIGN REVIEW

Review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the construction of an effective air barrier system. Provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper air barrier system. Provide copies of the Design Review Report not later than 14 days after approval of the Air Barrier Inspector Qualifications. Submit design data and calculations for the Air Barrier System for a manufacturer produced warranted air barrier system.

# PART 2 PRODUCTS

## 2.1 AIR BARRIER

Provide air barrier system of compatible parts from one or several manufacturers coordinated by the contractor or provide a single warranted system provided by a primary manufacturer. The air barrier system as part of a tested exterior wall assembly must meet the conditions of acceptance as tested in accordance with NFPA 285. Materials used for roof assembly air barrier must conform to the appropriate UL and FM wind and fire requirements for the specified roof assemblies.

If a complete air barrier system from a single manufacturer is utilized, whether warranted on not warranted, the air barrier system must conform to ASTM E2357.

Materials in the following categories as used in the air barrier system or assembly of the exterior wall system are tested and are required to conform to ASTM E2178 or JIS A 1324: Self-adhered sheet membranes, fluid applied membranes, spray polyurethane foam, mechanically fastened commercial building wrap, factory bonded membranes to sheathing, and adhesive backed commercial building wrap and accessory products.

Other materials used as an air barrier such as concrete, glass, wood, metal or gypsum board may or may not conform to ASTM E2178 or JIS A 1324 but are acceptable provided that when integrated into the air barrier system or assemblies that they are not subject to material or environmental induced degradation in their final produced state and once incorporated in the permanent construction.

All materials used must be identifiable through manufacturer testing data and/or literature to be compatible with all the attached or adjoining materials or substrates used in the system.

The building envelope shall be caulked, gasketed, weather-stripped, or otherwise sealed: around window and door frames; between wall cavities and frames; between walls and ceiling and roof; between walls and floors; at access doors and panels; at utility penetrations (mech, elec, comms, etc.) through walls, floors, and roofs; common walls between dwelling units; and at any other exterior envelope joint which may be a source of air leakage. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. These steps, in combination with provision of a continuous vapor barrier and sealed ductwork shall constitute tight building construction.

Provide Air Barrier System Shop Drawings, Material Samples for Air Barrier System and Air Barrier System Product Data.

# PART 3 EXECUTION

## 3.1 QUALITY CONTROL

### 3.1.1 Documentation and Reporting

Document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location of the air barrier installation, the results of the quality control procedures, and testing results.

### 3.1.2 Quality Control Testing And Inspection

Conduct the following tests and inspections as applicable in the presence of the Contracting Officer during installation of the air barrier system, and submit quality control reports as indicated below.

a. Provide a Daily Report of Observations with a copy to the Contracting Officer.

b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.

c. Inspect to assure structural support of the air barrier system to withstand design air pressures.

d. Inspect to assure masonry surfaces receiving air barrier materials are smooth, clean, and free of cavities, protrusions and mortar droppings, with mortar joints struck flush or as required by the manufacturer of the air barrier material.

e. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.

f. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must extend at least 50 mm beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.

g. Inspect to assure laps in materials are at least a 50-mm minimum,

shingled in the correct direction or mastic applied in accordance with manufacturer's recommendations, and with no fishmouths.

h. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.

i. Measure application thickness of liquid applied materials to assure that manufacturer's specifications for the specific substrate are met.

j. Inspect to assure that the correct materials are installed for compatibility.

k. Inspect to assure proper transitions for change in direction and structural support at gaps.

l. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.

m. Perform adhesion tests for fluid-applied and self-adhered air barrier membranes to assure that the manufacturer's specified adhesion strength properties are met. Determine the bond strength of coatings to substrate in accordance with ASTM D4541 or JIS A 9526.

n. Provide cohesion tests for spray polyurethane foam (SPF).

o. Provide written test reports of all tests performed.

## 3.2 REPAIR AND PROTECTION

Upon completion of inspection, testing, sample removal and similar services, repair damaged construction and restore substrates, coatings and finishes. Protect construction exposed by or for quality control service activities, and protect repaired construction.

-- End of Section --

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**04/06**

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# SECTION 07 32 13

# ROOF TILES
**04/06**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

| | |
|---|---|
| AWPA C1 | (2003) All Timber Products - Preservative Treatment by Pressure Processes |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C270 | (2019a; E 2019) Standard Specification for Mortar for Unit Masonry |
| ASTM D2178/D2178M | (2015a) Asphalt Glass Felt Used in Roofing and Waterproofing |
| ASTM D4586/D4586M | (2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free |

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

| | |
|---|---|
| NRCA 0437 | (2017) The NRCA Roofing Manual: Steep-slope Roof Systems |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5208 | (1996) Clay Roof tiles - water absorption and Transverse Strength Test |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Clay Tile Roofing System

SD-03 Product Data

Clay Tile

Underlayment Membrane

Flexible Hip and Ridge Flashing

Submit data including tile properties , styles, and configurations.

SD-04 Samples

Manufacturer's color charts for Clay Tile; G

Clay Tile; G

Submit an appropriate number of tiles for each type to illustrate the full range of colors and surface finish. Preservative-Treated lumber

SD-07 Certificates

Qualifications of roofing personnel

SD-08 Manufacturer's Instructions

Installation

## 1.3 DELIVERY AND STORAGE

Deliver materials in the manufacturer's unopened bundles and containers bearing the manufacturer's brand name. Keep materials dry, completely covered, and protected from the weather. Store according to manufacturer's written instructions.

## 1.4 WARRANTIES

### 1.4.1 Contractor's Warranty

The Contractor shall warrant for 5 years that the tile roofing system, as installed, is free from defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor shall make such repairs within 72 hours of notification. When repairs are not performed within the specified time, emergency repairs performed by others will not void the warranty.

## 1.5 COORDINATION

Do not install roofing materials until vent stacks and other penetrations through roof deck have been installed.

## 1.6 QUALITY ASSURANCE

### 1.6.1 Qualifications of Roofing Personnel

Submit documentation showing qualifications of personnel proposed to perform the roofing work and a listing identifying prior installations completed by the Contractor.

### 1.6.2 Clay Tile Roofing System Drawings

Submit drawings showing clay tile roofing installation and details for appearance, flashing and fastening of tiles.

# PART 2 PRODUCTS

## 2.1 MATERIALS

### 2.1.1 Clay Tile

JIS A 5208 Machine formed natural clay tiles, One Piece "S" Mission , kiln-fired to vitrification and free from surface imperfections. Provide specially shaped, color-matched units as indicatedor required, including hip and ridge covers, rake covers and birdstops. Provide with fastening holes preformed at factory prior to firing.

## 2.2 UNDERLAYMENT MEMBRANE

Provide underlayment membrane on surfaces that will be covered with tile. Membrane shall consist of asphalt glass felt.

### 2.2.1 Asphalt Glass Felt

ASTM D2178/D2178M, Type VI.

### 2.2.2 Flexible Hip and Ridge Flashing

SBS modified rubberized asphalt adhesive on a lineal, low density polyethylene membrane with a 1.52 mm total thickness.

## 2.3 FASTENERS

### 2.3.1 Nails For Applying Felt Underlayment

Hot dip galvanized steel, 2.9 mm thick, sharp pointed, conventional roofing nails with barbed shanks, minimum 9.5 mm diameter head, and of sufficient length to penetrate 19 mm into nailable concrete deck. Verify that nails are compatible with flashing materials to prevent galvanic action.

### 2.3.2 Nails for Installation of Tile

Copper ring shank nails, 3.3 mm, with minimum 11 mm diameter head or 3.3 mm stainless steel ring shank nails with minimum 9.5 mm head and of sufficient length to penetrate 19 mm into wood ridge and hip boards. Verify that chemicals used in pressure treatment of ridge and hip boards are compatible with copper nails.

### 2.3.3 Hurricane Clips

Tile edge clips fabricated from 1.07 mm, type 302 stainless steel strips, 13 mm wide. Provide with two nail holes in horizontal leg for anchorage to deck . Select material type as recommended by manufacturer for specific locations.

## 2.4 PRESERVATIVE-TREATED LUMBER

AWPA C1, provide treated ridge and hip boards, eave starter strips and battens

## 2.5 MORTAR

ASTM C270, Proportion specification for Type M mortar mix.

## 2.6 ASPHALT PLASTIC CEMENT

ASTM D4586/D4586M, Type I.

# PART 3 EXECUTION

## 3.1 EXAMINATION

Examine structural roof deck for compliance with requirements of selected system. Verify that roof penetrations and openings are installed in their proper location.

## 3.2 PREPARATION

### 3.2.1 Cleaning

Clean structural deck surfaces to receive substrate panels or underlayment.

## 3.3 INSTALLATION

Comply with manufacturer's installation instructions and recommendations, but not less than recommended by NRCA 0437. Comply with local building code requirements for special fastening requirements such as wind locks and hurricane clips in high wind areas.

### 3.3.1 Felt Underlayment

Apply one layer of felt underlayment horizontally over entire surface to receive roofing tile, lapping succeeding courses a minimum of 50 mm, end laps a minimum of 150 mm, and hips and valleys a minimum of 300 mm. Fasten felt with sufficient number of roofing nails to hold underlayment in place until roofing tile installation. Provide additional layer of felt underlayment when recommended by roof tile manufacturer.

### 3.3.2 Clay Roofing Tile Installation

Beginning at eaves, install roofing tiles as indicated and in accordance with recommendations of the tile manufacturer and fastening system manufacturer. Sawcut tiles at hips valleys and ridges. Cut tile at valleys to form a straight border. Taper valleys from a 50 mm exposure on each side of valley at top and increase exposure 25 mm, each side, per 2400 mm of valley length. Set ridge and hip tile in a full bed of mortar and strike mortar flush with face of cover tiles. Nail hip and ridge tiles to hip and ridge boards.

### 3.3.3 CLEANING

Remove mortar and asphalt plastic cement spatter from exposed surfaces of tiles. Upon completion of work, remove excess materials and all refuse generated by the work of this section.

## 3.4 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of English unit measurement, and not on metric measurement

commonly agreed to by the manufacturers or other parties. The English and metric units for the measurements shown are as follows:

| Products | English Units | Metric Units |
|---|---|---|
| Nails - diameter | 11 gage | 2.9 mm |
| head diameter | 3/8 inch | 9.5 mm |
| Nails - diameter | 10 gage | 3.3 mm |
| head diameter | 7/16 inch | 11 mm |
| Wire | 10 gage | 3.3 mm |
| | 12 gage | 2.5 mm |
| | 14 gage | 1.8 mm |
| | 0.037 inch | 9.4 mm |
| | 0.084 inch | 2.13 mm |
| Edge Clips | 18 gage | 1.2 mm |
| | 19 gage | 1.05 mm |
| | 0.042 inch | 1.07 mm |
| | 1/2 inch | 13 mm |
| Birdstop | 26 gage | 0.5 mm |

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# SECTION 07 84 00

# FIRESTOPPING
**05/10, CHG 1: 08/13**

## PART 1 GENERAL

### 1.1 SUMMARY

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.

b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; do not allow firestopping material to interfere with the required movement of the joint.

Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Where relevant, acceptable alternative Japanese Standards are listed following its comparable American counterpart. Contractor may substitute comparable JIS/JASS standards for non-Japanese standards, as approved by the Contracting Officer's Representative.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E84 | (2020) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E119 | (2022) Standard Test Methods for Fire Tests of Building Construction and Materials |
| ASTM E814 | (2013a; R 2017) Standard Test Method for Fire Tests of Penetration Firestop Systems |
| ASTM E1399/E1399M | (1997; R 2022) Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems |
| ASTM E1966 | (2015; R 2019) Standard Test Method for |

| | |
|---|---|
| | Fire-Resistive Joint Systems |
| ASTM E2174 | (2020a) Standard Practice for On-Site Inspection of Installed Firestop Systems |
| ASTM E2307 | (2020) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus |
| ASTM E2393 | (2020a) Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers |

FM GLOBAL (FM)

| | |
|---|---|
| FM 4991 | (2013) Approval of Firestop Contractors |
| FM APP GUIDE | (updated on-line) Approval Guide http://www.approvalguide.com/ |

INTERNATIONAL CODE COUNCIL (ICC)

| | |
|---|---|
| ICC IBC | (2021) International Building Code |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 723 | (2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials |
| UL 1479 | (2015; Reprint May 2021) Fire Tests of Through-Penetration Firestops |
| UL 2079 | (2015; Reprint Jul 2020) Tests for Fire Resistance of Building Joint Systems |
| UL Fire Resistance | (2014) Fire Resistance Directory |

## 1.3 SEQUENCING

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials. at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Locate cast-in-place firestop devices and install in place before concrete placement. Install pipe, conduit or cable bundles through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material must be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System; G

SD-03 Product Data

Firestopping Materials; G

SD-06 Test Reports

Inspection; G

SD-07 Certificates

Inspector Qualifications

Firestopping Materials

Installer Qualifications; G

## 1.5 QUALITY ASSURANCE

### 1.5.1 Installer

Engage an experienced Installer who is:

a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or

b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer must be a trained representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. Obtain and submit installer's written certification of training, and retain proof of certification for duration of firestop installation.

### 1.5.2 Inspector Qualifications

The inspector must have a minimum of two years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector must be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector must not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected. Include in the qualifications submittal a notarized statement assuring compliance with the requirements stated herein.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in

accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

## PART 2 PRODUCTS

### 2.1 FIRESTOPPING SYSTEM

Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, submit a manufacturer's engineering judgment, derived from similar UL system designs or other tests for review and approval prior to installation. Submittal must indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

Also, submit a written report indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL list printed numbers.

### 2.2 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

#### 2.2.1 Fire Hazard Classification

Provide material that has a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Provide an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

#### 2.2.2 Toxicity

Provide material that is nontoxic and carcinogen free to humans at all stages of application or during fire conditions and does not contain hazardous chemicals or require harmful chemicals to clean material or equipment.

#### 2.2.3 Fire Resistance Rating

Firestop systems must be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems must also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

##### 2.2.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SUMMARY, must provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Provide fire resistance ratings as

follows:

2.2.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = one hourRating of wall or partition being penetrated.

2.2.3.1.2 Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the Ceiling Membrane of Roof-Ceiling Assemblies

F Rating = one hour, T Rating = one hour. Where the penetrating item is outside of a wall cavity the F rating must be equal to the fire resistance rating of the floor penetrated, and the T rating must be in accordance with the requirements of ICC IBC.

2.2.3.1.3 Penetrations of Fire and Smoke Resistance Rated Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = one hour, T Rating = one hour and L Rating = Where L rating is required.

2.2.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SUMMARY, and gaps such as those between floor slabs and curtain walls must be the same as the construction in which they occur. Provide construction joints and gaps with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Provide curtain wall joints with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints must meet the cycling requirements of ASTM E1399/E1399M or UL 2079. Provide a minimum class II movement capability for all joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly.

2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the specified requirements. Provide certification of compliance with UL 1479 for all intumescent firestop materials used in through penetration systems.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping must be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement must be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 100 mm or more in any direction must be capable of supporting the same load as the floor

is designed to support or be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.

c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.

d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

e. Construction joints in floors and fire rated walls and partitions.

f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Cut and remove thermal insulation where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Seal cabling for data and communication applications with re-enterable firestopping products and devices as indicated.

3.2.3.1 Re-Enterable Devices

Provide firestopping devices that are pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf measured at ambient temperature and 205 degrees C at 0 percent to 100 percent visual fill.

3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Allow for cable moves, additions or changes. Provide devices capable of maintaining the fire resistance

rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

## 3.3 INSPECTION

For all projects, do not cover or enclose until inspection is complete and approved by the Contracting Officer. The inspector must inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL listed printed numbers.

### 3.3.1 Inspection Standards

Inspect all firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

### 3.3.2 Inspection Reports

Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

-- End of Section --

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**08/16**

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# SECTION 07 92 00

# JOINT SEALANTS
**08/16**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E84 | (2020) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM C919 | (2012; R 2017) Standard Practice for Use of Sealants in Acoustical Applications |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5758 | (2016) Sealants for Sealing and Glazing in Buildings |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 9 | (2019) Building Construction Standard Specifications - Chapter 9 Waterproofing Construction |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

### 1.3 PRODUCT DATA

Include storage requirements, shelf life, curing time, instructions for mixing and application, and accessories. Provide manufacturer's Safety Data Sheets (SDS) for each solvent, primer and sealant material proposed.

### 1.4 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 4 and 32 degrees C.

### 1.5 DELIVERY AND STORAGE

Deliver materials to the jobsite in unopened manufacturers' sealed shipping containers, with brand name, date of manufacture, color, and

material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Handle and store materials in accordance with manufacturer's printed instructions. Prevent exposure to foreign materials or subjection to sustained temperatures exceeding 32 degrees C or lower than 4 degrees C. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

## 1.6 QUALITY ASSURANCE

### 1.6.1 Compatibility with Substrate

Verify that each sealant is compatible for use with each joint substrate in accordance with sealant manufacturer's printed recommendations for each application.

### 1.6.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

### 1.6.3 Mock-Up

Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

### 1.6.4 Adhesion

Provide in accordance with JIS A 5758.

# PART 2 PRODUCTS

## 2.1 SEALANTS

Provide sealant products that have been tested, found suitable, and documented as such by the manufacturer for the particular substrates to which they will be applied, and comply with MLIT SS Chapter 9.

In areas with ambient temperatures that exceed 43.33 degrees C, do not use polybutene, bituminous, acrylic-latex, polyvinyl acetate latex sealants, polychloroprene (neoprene), and polyurethane foams, and neoprene, and styrene butadiene rubber extruded seals and closure strips due to these materials having maximum recommended surface temperature ranges from 54.44 degrees C to 82.22 degrees C.

### 2.1.1 Interior Sealants

Provide sealant products per JIS A 5758, used on the interior of the building (defined as inside of the weatherproofing system) meeting VOC content requirements to attain F4-Star, and meet Japan Sealants Industry Association requirement. Provide certification or validation of indoor air quality for interior sealants. Location(s) and color(s) of sealant for the following. Note, color "as selected" refers to manufacturer's full range of color options

| LOCATION | COLOR |
|---|---|
| a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface mounted equipment and fixtures, and similar items. | As selected |
| b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces. | As selected |
| c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed. | As Selected |
| d. Joints between edge members for acoustical tile and adjoining vertical surfaces. | As Selected |
| e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted. | As Selected |
| f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where non-planar tile surfaces meet. | As Selected |
| g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change. | As Selected |
| h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers. | As Selected |

### 2.1.2 Exterior Sealants

For joints in vertical surfaces and horizontal surfaces, provide JIS A 5758. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

| LOCATION | COLOR |
|---|---|
| a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations. | Match adjacent surface color As selected |
| b. Expansion and control joints. | As Selected |
| c. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required. | As Selected |
| d. Voids where items pass through exterior walls. | As Selected |
| e. Metal-to-metal joints where sealant is indicated or specified. | As Selected |

### 2.1.3 Floor Joint Sealants

Provide sealant products per JIS A 5758 used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of UL 2818(Greenguard) Gold, SCS Global Services Indoor Advantage Gold, CDPH Section 01350 (limit requirements of either

office or classroom spaces regardless of space type), VOC content requirements of SCAQMD Rule 1168, or F4-star, and meet Japan Sealant Industry Association requirement. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

| LOCATION | COLOR |
|---|---|
| a. Seats of metal thresholds for exterior doors. | As selected |
| b. Control and expansion joints in floors, slabs, ceramic tile, and walkways. | As Selected |

2.1.4 Acoustical Sealants

Rubber or polymer based acoustical sealant in accordance to ASTM C919, to have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Provide non-staining acoustical sealant with a consistency of 250 to 310. Acoustical sealant must remain flexible and adhesive after 500 hours of accelerated weathering. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) to have low or no pollutant emissions.

2.1.5 Preformed Sealants

Provide preformed sealants of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealants capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 34 to plus 71 degrees C, sealants must be non-bleeding and have no loss of adhesion.

2.1.5.1 Tape

Tape sealant: Provide cross section dimensions of as required by condition.

2.1.5.2 Bead

Bead sealant: Provide cross section dimensions of as required by condition.

2.1.5.3 Foam Strip

Provide foam strip of polyurethane foam with cross section dimensions of as required by condition. Provide foam strip capable of sealing out moisture, air, and dust when installed and compressed in accordance with manufacturer's printed instructions. Service temperature must be minus 40 to plus 135 degrees C. Furnish untreated strips with adhesive to hold them in place. Do not allow adhesive to stain or bleed onto adjacent finishes. Saturate treated strips with butylene waterproofing or impregnate with asphalt.

2.2 PRIMERS

Non-staining, quick drying type and consistency as recommended by the sealant manufacturer for the particular application. Provide primers for

interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

## 2.3 BOND BREAKERS

Type and consistency as recommended by the sealant manufacturer to prevent adhesion of the sealant to the backing or to the bottom of the joint. Provide bond breakers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

## 2.4 BACKSTOPS

Provide glass fiber roving, neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Provide backstop material that is compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.

### 2.4.1 Rubber

Provide in accordance per manufacturer requirement round cross section for cellular rubber sponge backing.

### 2.4.2 Silicone Rubber Base

Provide in accordance with JIS A 5758. Color as selected from manufacturer's full range of color choices .

## 2.5 CAULKING

For interior use and only where there is little or no anticipated joint movement. Provide products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350(limit requirements of either office or classroom spaces regardless of space type), VOC content requirements of SCAQMD Rule 1168, or F-4 Star. Provide certification or validation of indoor air quality for interior caulking.

## 2.6 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent aluminum and bronze surfaces from solvents. Provide solvents for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

# PART 3 EXECUTION

## 3.1 FIELD QUALITY CONTROL

Perform a field adhesion test in accordance with manufacturer's instructions. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken.

## 3.2 SURFACE PREPARATION

Prepare surfaces according to manufacturer's printed installation instructions. Clean surfaces from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would destroy or impair adhesion. Remove oil and grease with solvent; thoroughly remove solvents prior to sealant installation. Wipe surfaces dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, provide in accordance with sealant manufacturer's printed instructions for each specific surface.

### 3.2.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finished work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue free solvent. Remove resulting debris and solvent residue prior to sealant installation.

### 3.2.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

### 3.2.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

### 3.2.4 Wood Surfaces

Ensure wood surfaces that will be in contact with sealants are free of splinters, sawdust and other loose particles.

### 3.2.5 Removing Existing Hazardous Sealants

For sealants applied prior to 1979, or that have been tested and found to contain polychlorinated biphenyls (PCBs), remove and dispose of these sealants in accordance with Section 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs).3.3 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

## 3.4 APPLICATION

### 3.4.1 Joint Width-To-Depth Ratios

Acceptable Ratios:

| JOINT WIDTH | JOINT DEPTH | |
|---|---|---|
| | Minimum | Maximum |
| For metal, glass, or other nonporous surfaces: | | |
| 6 mm (minimum) | 6 mm | 6 mm |
| over 6 mm | 1/2 of width | Equal to width |
| For wood, concrete, masonry, stone: | | |
| 6 mm (minimum) | 6 mm | 6 mm |
| over 6 mm to 13 mm | 6 mm | Equal to width |
| over 13 mm to 25 mm | 50 mm | 16 mm |
| Over 25 mm | prohibited | |

Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is prohibited at metal surfaces.

### 3.4.2 Unacceptable Sealant Use

Do not install sealants in lieu of other required building enclosure weatherproofing components such as flashing, drainage components, and joint closure accessories, or to close gaps between walls, floors, roofs, windows, and doors, that exceed acceptable installation tolerances. Remove sealants that have been used in an unacceptable manner and correct building enclosure deficiencies to comply with contract documents requirements.

### 3.4.3 Masking Tape

Place masking tape on the finished surface on one or both sides of joint cavities to protect adjacent finished surfaces from primer or sealant smears. Remove masking tape within 10 minutes of joint filling and tooling.

### 3.4.4 Backstops

Provide backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide joints in specified depths. Provide backstops where indicated and where backstops are not indicated but joint cavities exceed the acceptable maximum depths specified in JOINT WIDTH-TO-DEPTH RATIOS Table.

### 3.4.5 Primer

Clean out loose particles from joints immediately prior to application of. Apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's printed instructions. Do not apply primer to exposed finished surfaces.

### 3.4.6 Bond Breaker

Provide bond breakers to surfaces not intended to bond in accordance with, sealant manufacturer's printed instructions for each type of surface and sealant combination specified.

### 3.4.7 Sealants

Provide sealants compatible with the material(s) to which they are applied. Do not use a sealant that has exceeded its shelf life or has jelled and cannot be discharged in a continuous flow from the sealant gun. Apply sealants in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Work sealant into joints so as to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Apply sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply additional sealant, and tool smooth as specified. Apply sealer over sealants in accordance with the sealant manufacturer's printed instructions.

## 3.5 PROTECTION AND CLEANING

### 3.5.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled and no residual tape marks remain.

### 3.5.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately remove fresh sealant that has been smeared on adjacent masonry, rub clean with a solvent, and remove solvent residue, in accordance with sealant manufacturer's printed instructions. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding. Remove resulting debris.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent moistened cloth. Remove solvent residue in accordance with solvent manufacturer's printed instructions.

-- End of Section --

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DIVISION 08 - OPENINGS

SECTION 08 11 13

STEEL DOORS AND FRAMES

**08/20**

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SECTION 08 11 13

STEEL DOORS AND FRAMES
**08/20**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

| | |
|---|---|
| ANSI/SDI A250.8 | (2017) Specifications for Standard Steel Doors and Frames |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 4702 | (2021) Doorsets |
| JIS G 3302 | (2019) Hot Dip Zinc Coated Steel Sheet and Strip |
| JIS G 3313 | Electrolytic Zinc-Coated Steel Sheet and Strip |
| JIS G 3317 | (2019) Hot-Dip Zinc-5 Percent Aluminum Allot-Coated Steel Sheet and Strip |
| JIS Z 3420 | (2003) Specification and Approval of Welding Procedures for Metallic Materials - General Rules |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 16 | (2019) Building Construction Standard Specifications - Chapter 16 Opening Construction |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 105 | (2016; TIA 16-1) Standard for Smoke Door Assemblies and Other Opening Protectives |
| NFPA 252 | (2022) Standard Methods of Fire Tests of Door Assemblies |
| NFPA 80 | (2022) Standard for Fire Doors and Other Opening Protectives |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 10C | (2016) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Frames; G

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of Doors; G

Schedule of Frames; G

Submit door and frame locations.

## 1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 6 mm airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

# PART 2 PRODUCTS

## 2.1 STANDARD STEEL DOORS

JIS A 4702, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00 DOOR HARDWARE. Undercut where indicated. Provide exterior doors with top edge closed flush and sealed to prevent water intrusion. Provide doors at 44.5 mm thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content.

### 2.1.1 Classification - Level, Performance, Model

#### 2.1.1.1 Heavy Duty Doors (Level 2)

45 mm door thickness, 1.0 mm door faces steel thickness, 1.3 mm frames steel thickness full flush seamless, with core construction as required by the manufacturer for interior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation. Provide door classification label per JIS A 4702.

2.1.1.2 Extra Heavy Duty Doors (Level 3)

45 mm door thickness, 1.3mm door faces and frames steel thickness, full flush seamless with core construction as required by the manufacturer for interior doors and for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with mineral board insulation. Provide door classification label per JIS A 4702.

2.2 INSULATED STEEL DOOR SYSTEMS

Provide insulated steel doors with a core of polyurethane foam; face sheets, edges, and frames of galvanized steel not lighter than 0.7 mm thick, 1.5 mm thick, and 1.5 mm respectively; magnetic weatherstripping; nonremovable-pin hinges; thermal-break aluminum threshold; and vinyl door bottom. Provide to doors and frames a phosphate treatment, rust-inhibitive primer, and baked acrylic enamel finish. Door shall meet JIS A 4702 and tested for 500,000 cycles. Prepare doors to receive specified hardware. Provide doors 44.5 mm thick.

2.3 SOUND RATED STEEL DOORS

Provide sound rated doors with a Transmission Loss (TL) as indicated on the drawings.

2.4 ACCESSORIES

2.4.1 Louvers

2.4.1.1 Interior Louvers

Where indicated, provide louvers of stationary type where scheduled. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 1 mm thick steel and louver blades of a minimum 0.6 mm.

2.4.2 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors.

2.4.3 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings.

2.5 INSULATION CORES

Provide insulating cores of the type specified, and provide an apparent U-factor per insulation requirements in accordance with JIS A4702, H-5

2.6 STANDARD STEEL FRAMES

Provide hardware reinforcing thickness per ANSI/SDI A250.8 requirement. Form frames to sizes and shapes indicated, with welded corners. Provide

steel frames for doors, sidelights, mullions, cased openings, and interior glazed panels, unless otherwise indicated. Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame product.

2.6.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of Welding Code per JIS Z 3420 and in accordance with the practice specified by the producer of the metal being welded.

2.6.2 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.2.6.3 Mullions and Transom Bars

Provide mullions and transom bars of closed or tubular construction with heads and jambs butt-welded together. Bottom of door mullions must have adjustable floor anchors and spreader connections.

2.6.4 Stops and Beads

Provide form and loose stops and beads from 0.9 mm thick steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 300 to 400 mm on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.6.5 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.6.6 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated not lighter than 1.2 mm thick.

2.6.6.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 2285 mm in height, provide one additional anchor for each jamb for each additional 760 mm or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 5 mm diameter steel wire, adjustable or T-shaped;

b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;

c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with JIS A 4702; and

d. Solid plaster partitions: Secure anchors solidly to back of frames and tie into the lath. Provide adjustable top strut anchors on each side of frame for fastening to structural members or ceiling construction above. Provide size and type of strut anchors as recommended by the frame manufacturer.

2.6.6.2 Floor Anchors

Provide floor anchors drilled for 10 mm anchor bolts at bottom of each jamb member.

## 2.7 FIRE AND SMOKE DOORS AND FRAMES

Provide fire and smoke doors and frames in accordance with NFPA 80 and NFPA 105 and this specification. Include insulated core materials in fire doors where indicated in the door schedule.

### 2.7.1 Labels

Provide fire doors and frames bearing the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing must be in accordance with NFPA 252 or UL 10C. Provide labels that are metal with raised letters, bearing the name or file number of the door and frame manufacturer. Labels must be permanently affixed at the factory to frames and to the hinge edge of the door. Do not paint door and labels. Use of Japanese tested and labeled fire doors, up to 20 minutes, is permitted. NFPA 252 paragraph 6.2.2 requires hose stream test for fire rated doors greater than 20 minutes. Japanese manufactured fire rated doors are not subjected to hose stream tests and are not deemed equivalent to US products or requirements.

### 2.7.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

### 2.7.3 Astragal on Fire and Smoke Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements. On smoke control doors, conform to NFPA 105.

## 2.8 EXTERIOR FRAMES

Provide thermal insulation in all exterior frames. Provide frames of a minimum Level 4, with frames of a minimum thickness of 1.7 mm, 14 gage.

## 2.9 WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE.

## 2.10 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in JIS A 4702.

Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of JIS A 4702. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of JIS A 4702, as applicable. Punch door frames , with the exception of frames that will have weatherstripping or soundproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

## 2.11 FINISHES

### 2.11.1 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate doors and frames from hot dipped zinc coated steel, alloyed type, that complies with JIS G 3302 and JIS G 3317. The coating weight must meet or exceed the minimum requirements for coatings having zinc-5 percent. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in JIS A 4702..

### 2.11.2 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with JIS G 3313, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in JIS A 4702.

## 2.12 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 3 mm larger than the actual masonry thickness. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

### 2.12.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

## 2.13 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

# PART 3 EXECUTION

## 3.1 INSTALLATION

### 3.1.1 Frames

Set frames in accordance with JIS A 4702 and MLIT SS Chapter 16. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing.

### 3.1.2 Doors

Hang doors in accordance with clearances specified in JIS A 4702 and MLIT SS Chapter 16. After erection and glazing, clean and adjust hardware.

### 3.1.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. Install fire rated smoke doors and frames in accordance with NFPA 80 and NFPA 105.

## 3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

## 3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

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# SECTION 08 11 16

# ALUMINUM DOORS AND FRAMES
**05/17**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

| | |
|---|---|
| ISO 16932 | (2007) Glass in Buildings - Destructive Windstorm-Resistant Security Glazing - Test and Clarification |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1516 | (1998) Windows and Doorsets - Air Permeability Test |
| JIS A 1517 | (1996) Windows and Doorsets-Watertightness Test Under Dynamic Pressure |
| JIS A 4702 | (2021) Doorsets |
| JIS H 4000 | (2017) Aluminium and Aluminium Alloy Sheets, Strips and Plates (Amendment 1) |
| JIS H 4100 | (2015) Aluminium and Aluminium Alloy Extruded Profiles |
| JIS H 4040 | (2015) Aluminum and Aluminum Alloy Bars and Wires |
| JIS H 8602 | (2010) Combined Coatings of Anodic Oxide and Organic Coatings on Aluminum and Aluminum Alloys |
| JIS K 5906 | (1998) Aluminum Pigments For Paints |
| JIS R 3109 | (2018) Glass in Building - Destructive-Windstorm-Resistant Security Glazing - Test Method |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 16 | (2019) Building Construction Standard Specifications - Chapter 16 Opening Construction |

## 1.2 PERFORMANCE REQUIREMENTS

### 1.2.1 Wind Borne Debris

Provide impact resistant door assemblies meeting the Windborne-Debris-Impact Resistant Performance requirements of JIS R 3109 as follows:

(1) Pass missile-impact tests when tested according to JIS R 3109 for missiles A and D in Table 2 or ISO 16932 (Missile C).

### 1.2.2 Air Infiltration

When tested in accordance with JIS A 1516, air infiltration per door leaf cannot exceed 2.83 by 10-4 cms per square meter of fixed area at a test pressure of 0.30 kPa.

### 1.2.3 Water Penetration

When tested in accordance with JIS A 1517, there can be no water penetration at a pressure of 0.14 kPa of fixed area.

### 1.2.4 Thermal Transmittance, Solar Heat Gain, Visible Light Transmittance

#### 1.2.4.1 U-Factor

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area with U-Factor as indicated in the drawings..

#### 1.2.4.2 Solar Heat Gain Coefficient (SHGC)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the National Fenestration Rating Council with a whole window SHGC of as indicated in the drawings.

#### 1.2.4.3 Visible Light Transmittance (VLT)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area with VLT as indicated in the drawings.

#### 1.2.4.4 Doors with Less than 50 Percent Glazed Area

For exterior aluminum entrances doors with less than 50 percent glazed area, the glazed area is considered the fenestration area with a whole window U-Factor, SHGC and VLT as required above.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

For Each Type of Door and Frame Assembly; G

SD-04 Samples

Finish Samples; G

SD-06 Test Reports

Air Infiltration; G

Water Penetration; G

SD-10 Operation and Maintenance Data

Adjustments, Cleaning, and Maintenance; G

## 1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on non-absorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which caulking and glazing compounds must adhere.

## 1.5 QUALITY CONTROL

### 1.5.1 Shop Drawing

Indicate elevations and sections for each type of door and frame assembly. Show sizes and details of each assembly, frame construction,subframe attachment, thickness and gages of metal, details of door and frame construction, proposed method(s) of anchorage, glazing details, provisions for an location of hardware, mullion details, method and materials for flashing and weatherstripping, miscellaneous trim, installation details, and other related items necessary for a complete representation of all components. A qualified blast engineer must perform testing or calculations for door system design resistance to specified blast loads.

### 1.5.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

### 1.5.3 Operation and Maintenance Data

Submit detailed instructions for installation, adjustments, cleaning, and maintenance of each type of assembly indicated.

# PART 2 PRODUCTS

## 2.1 DOORS AND FRAMES

Provide swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, adjoining side lites, trim, and accessories.

## 2.2 MATERIALS

### 2.2.1 Anchors

Stainless steel or steel with hot-dipped galvanized finish.

### 2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer, and per JIS A 4702.

### 2.2.3 Aluminum Alloy for Doors and Frames

JIS H 4040, Alloy 6063-T5 for extrusions. JIS H 4000, alloy and temper best suited for aluminum sheets and strips.

### 2.2.4 Fasteners

Hard aluminum or stainless steel.

### 2.2.5 Structural Steel

JIS H 4100.

### 2.2.6 Aluminum Paint

Aluminum door manufacturer's standard aluminum paint.

## 2.3 FABRICATION

### 2.3.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide removable glass stops and glazing beads for frames accommodating fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 300 mm on center. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

### 2.3.2 Aluminum Doors

Of type, size, and design indicated and minimum 45 mm thick. minimum wall thickness, 3 mm, except beads and trim, 1.25 mm. Door sizes shown are nominal; include standard clearances as follows: 2.5 mm at hinge and lock stiles, 3 mm between meeting stiles, 3 mm at top rails, 5 mm between bottom and threshold, and 17 mm between bottom and floor. Provide bevel single-acting doors 2 or 3 mm at lock, hinge, and meeting stile edges.

#### 2.3.2.1 Full Glazed Stile and Rail Doors

Provide doors with medium stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 10 or 13 mm diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

2.3.2.2 Flush Doors

Use facing sheets with a plain smooth surface. Use one of the following constructions:

a. A phenolic resin-impregnated kraft paper honeycomb core, surrounded at edges and around glass and louvered areas with extruded aluminum shapes. Provide cores with a minimum impregnation of 18 percent resin content. Provide sheet aluminum door facings minimum 0.8 mm thick laminated to a 2.5 mm thick tempered hardboard backing, with the backing bonded to the honeycomb core. Bond facing sheets to cores under heat and pressure with thermosetting adhesive and mechanically lock to extruded edge members.

b. A phenolic resin-impregnated kraft paper honeycomb core. Use aluminum facing sheets minimum 1.25 mm thick and form into two pans to eliminate seams on faces. Bond honeycomb core to face sheets using epoxy resin or contact cement-type adhesive.

c. A solid fibrous core, surrounded at edges and around glass and louvered areas and cross braced at intermediate points with extruded aluminum shapes. Use aluminum facing sheets of minimum 1.25 mm thickness. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.

d. Form from extruded tubular stiles and rails mitered at corners, reinforce, and continuously weld at miters. Provide facing sheets of minimum 0.8 mm thick sheet aluminum internally reinforced with aluminum channels or Z-bars placed horizontally not more than 400 mm apart and extending the full width of panels. Fit spaces between reinforcing with sound-deadening insulation. Weld facing sheets to reinforcing bars or channels and to stiles and rails. Finish facing sheets flush with faces of stiles and rails.

e. Form from an internal grid composed of extruded aluminum tubular sections. Provide tubular sections at all sides and perimeter of louver and glass openings. Provide three extruded aluminum tubular sections at top and bottom of each door. Provide wall thickness of tubular sections minimum 2.25 mm except at lock rails which must be minimum 3 mm thick, hinge lock rails which must be minimum 3 mm thick, and hinge rail edges which must be minimum 5 mm thick. Fill spaces in door with mineral insulation. Provide facing sheets of aluminum minimum 2.25 mm thick.

f. Form from extruded aluminum members at top and bottom, both sides, and at perimeters of louver and glass openings. Provide wall sections of extruded aluminum members minimum 2.25 mm thick and reinforce for application of hardware. Cover framing members on both sides with aluminum facing sheets minimum 2 mm thick. Fill door panels with 40 kg per cubic meter density, chlorofluorocarbon (CFC) free, foamed urethane with a flame spread rating of no more than 25.

2.3.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts

will be permitted only in inconspicuous locations, and must have countersunk heads. Weld concealed reinforcements for hardware in place.

2.3.4 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping must be replaceable without special tools, and adjustable at meeting rails of pairs of doors. During installation, verify doors swing freely and close positively. Refer to paragraph AIR INFILTRATION for air leakage requirements and testing.

2.3.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. Reinforce and anchor freestanding door frames to floor construction as indicated on approved shop drawings and in accordance with manufacturer's recommendation. Place anchors near top and bottom of each jamb and at intermediate points not more than 635 mm apart.

2.3.6 Provisions for Hardware

Coordinate with Section 08 71 00 DOOR HARDWARE. Deliver hardware templates and hardware (except field-applied hardware) to the door manufacturer for use in fabrication of aluminum doors and frames. Cut, reinforce, drill, and tap doors and frames at the factory to receive template hardware. Provide doors to receive surface-applied hardware, except push plates, kick plates, and mop plates, with reinforcing only; drill and tap in the field. Provide hardware reinforcements of stainless steel or steel with hot-dipped galvanized finish, and secure with stainless steel screws. Provide reinforcement in core of flush doors as required to receive locks, door closers, and other hardware.

2.3.7 Provisions for Glazing

Provide extruded aluminum snap-in glazing beads on interior side of doors. Provide glazing beads with vinyl insert glazing gaskets. Design glazing beads to receive thickness indicated for each glazed assembly. Coordinate requirements with Section 08 81 00 GLAZING.

2.3.8 Finishes

Provide exposed aluminum surfaces with factory finish of anodic coating or organic coating.

2.3.8.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to JIS H 8602. Provide as selected from manufacturer's complete range of color options.

2.3.8.2 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a baked enamel finish in accordance with JIS K 5906 with total dry film thickness minimum 0.02 mm. Finish color to be as indicated .

# PART 3 EXECUTION

## 3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors, adjoining side lites, and, adjoining window walls per MLIT SS Chapter 16. Anchor frames to adjacent construction as indicated and in accordance with manufacturer's printed instructions and the approved shop drawings. Install anchorage that complies with applicable structural requirements. Anchor bottom of each frame to rough floor construction with 2.4 mm thick minimum stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors. Hang doors to produce clearances specified in paragraph ALUMINUM DOORS. After erection and glazing, adjust doors and hardware to operate properly.

## 3.2 PROTECTION FROM DISSIMILAR MATERIALS

### 3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact to dissimilar metals.

#### 3.2.1.1 Protection

Provide one of the following systems to protect surfaces in contact with dissimilar metals:

a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.

b. Apply elastomeric sealant between aluminum and dissimilar metals in accordance with Section 07 92 00 JOINT SEALANTS.

c. Paint dissimilar metals with one coat of primer and one coat of aluminum paint.

d. Use a non-absorptive tape or gasket in permanently dry locations.

### 3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint to prevent aluminum discoloration.

### 3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

### 3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood, with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting aluminum, paint the wood or other absorptive surface with two coats of aluminum paint and seal joints with elastomeric sealant.

## 3.3 SEALING AROUND ASSEMBLIES

Seal all penetrations of the air barrier by sealing around door openings as necessary to achieve compliance with air leakage requirements. Flash all doors with corrosion resistant flashing to prevent water intrusion.

## 3.4 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's written recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

## 3.5 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --

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# SECTION 08 31 00

# ACCESS DOORS AND PANELS
**05/17, CHG 1: 08/18**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

| | |
|---|---|
| AWS D1.1/D1.1M | (2020; Errata 1 2021) Structural Welding Code - Steel |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A36/A36M | (2019) Standard Specification for Carbon Structural Steel |
| ASTM A653/A653M | (2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| ASTM A666 | (2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar |
| ASTM A1008/A1008M | (2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable |
| ASTM E119 | (2022) Standard Test Methods for Fire Tests of Building Construction and Materials |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 4702 | (2021) Doorsets |
| JIS G 3136 | (2022) Rolled Steels for Building Structure |
| JIS G 4305 | (2008) Cold-rolled Stainless Steel Plate, Sheet and Strip |

MASTER PAINTERS INSTITUTE (MPI)

| | |
|---|---|
| MPI 79 | (2016) Primer, Alkyd, Anti-Corrosive for Metal |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 80 | (2022) Standard for Fire Doors and Other Opening Protectives |
| NFPA 252 | (2022) Standard Methods of Fire Tests of Door Assemblies |
| NFPA 288 | (2017) Standard Methods of Fire Tests of Horizontal Fire Door Assemblies Installed in Horizontal Fire Resistance-Rated Assemblies |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 10B | (2008; Reprint May 2020) Fire Tests of Door Assemblies |
| UL 263 | (2011; Reprint Aug 2021) UL Standard for Safety Fire Tests of Building Construction and Materials |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Access Doors And Panels; G

SD-03 Product Data

Access Doors And Panels; G

Hardware Including Locks and Keys; G

Accessories; G

Recycled Content; S

SD-04 Samples

Finishes; G

## 1.3 MISCELLANEOUS REQUIREMENTS

For access doors and panels provide the following:

### 1.3.1 Shop Drawings

For field assembled access doors and panels, provide plans, elevations, sections, and details for each type of access door and panel assembly. Indicate frame, surface and edge construction, materials, and accessories. Indicate types of finished surfaces and details for panel edge conditions. Provide a door schedule with a unique number for each access door and panel, specific location in the project, location of

hinges and hardware for each door.

1.3.2 Product Data

For shop assembled access doors and panels, provide literature indicating sizes, types, frame and edge construction, finishes, hardware, accessories such as gaskets, seals and weatherstripping, and location of each door and panel in the project. Indicate. Provide details of adjoining work for each condition indicated.

1.3.3 Finish Samples

Submit two color charts from manufacturer's standard color and finish options for each type of frame and panel assembly finish indicated.

1.3.4 Test Reports

Provide test reports for fire-rated assemblies when tested in accordance with NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically and NFPA 288 for fire-rated access door assemblies installed horizontally.1.4 PERFORMANCE REQUIREMENTS

1.4.1 Access Panels for Wet Areas

Provide panel assemblies that will be located in wet areas with corrosion resistant finishes and hardware and water resistant gasketing.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

2.2.1 Steel Plates, Shapes, and Bars

Provide in accordance with ASTM A36/A36M or JIS A 4702.

2.2.2 Sheet Steel

Provide cold rolled steel sheet substrate in accordance with ASTM A1008/A1008M or JIS G 3136, Commercial Steel (CS), exposed.

2.2.3 Stainless Steel

Provide in accordance with ASTM A666 or JIS G 4305, type 302 or 304.

2.2.4 Metallic Coated Steel Sheet

Provide in accordance with ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

### 2.2.5 Hardware

Provide automatic closing devices. Provide latch releases operable from insides of doors. Provide anchors in accordance with applicable fire test parameters.

### 2.2.6 Hinges

Provide concealed spring hinges, 175 degrees of opening, with removable hinge pins to allow removal of door panel from frame. Provide hinges of same steel as door and frame or in accordance with manufacturer's written recommendations. If providing non-continuous hinges, provide in numbers required to maintain alignment of door panel with frame. Provide coatings as necessary to permanently protect dissimilar metals from contact with one another; see Part 3 herein for more information.

### 2.2.7 Locks

Unless otherwise indicated, provide flush screwdriver operated cam lock. Provide plastic sleeve or stainless steel bushings to protect holes in surface finishes for screwdriver to access lock.tamper proof screws (spanner head locks) for access panels in locations requiring such security.

### 2.2.8 Accessories

Provide anchors in size, number and location on four sides to secure access door to substrate. Provide anchors in types as recommended by manufacturer's written installation instructions for each substrate indicated. Provide shims, bushings, clips, gaskets, and other devices as necessary for a complete installation.

## 2.3 FABRICATION

### 2.3.1 Thickness, Size, Edges

Fabricate frames for access doors of steel not lighter than 16 gage with welded joints and anchorage for securing to adjacent construction. Provide doors a minimum of 600 by 600 mm and of not lighter than 16 gage steel, with stiffened edges and welded attachments. Provide with eased (lightly rounded) edges, without burrs, snags or sharpness and exposed welds ground smooth.

### 2.3.2 Welding

Provide in accordance with AWS D1.1/D1.1M.

## 2.4 ACCESS ASSEMBLY TYPES

Unless indicated otherwise, provide flush-face steel access doors and panels with steel frames and flanges.

### 2.4.1 Recessed Doors

Provide recessed access doors. Depth of door panel recess must accommodate the installed thickness of the finish material of the wall assembly for a flush finished condition of the wall and the access panel face. Reinforce panel and frame to prevent sagging.

2.4.2 Fire-rated Doors

2.4.2.1 Door Construction

Provide ceiling access door construction in accordance with ASTM E119 or UL 263. Provide wall access doors in accordance with NFPA 252 or UL 10B.

2.4.2.2 Labels

Provide class B opening according to UL 10B or test by another nationally recognized laboratory, approved by the Contracting Officer. Provide fire-rating as indicated herein, with a maximum temperature rise of 120 degrees C.

2.4.2.3 Door Panel and Frame

Steel sheet, with mineral fiber insulation core, insulated sandwich type construction.

2.5 FINISHES

Provide steel frames and panel surfaces with a baked enamelProvide manufacturer's standard two coat finish system consisting of one coat primer and one thermoset topcoat. Provide dry film thickness in 0.05 mm minimum. Provide exposed fastenings that approximately match the color and finish of the each material to which fastenings are applied.

PART 3 EXECUTION

3.1 PREPARATION

Field verify all measurements prior to fabrication. Verify access door locations and sizes provide required maintenance access to installed building services components. Protect existing construction and completed work from damage during installation.

3.2 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, in accordance with manufacturer's written instructions. Include materials and parts as necessary for a complete installation of each item. Conceal fastenings where practicable. Poor matching of holes to fasteners is cause for rejection of the work.

3.3 ACCESS LOCATIONS

Install removable access panels directly below each valve, flow indicator, damper, air splitter or other utility requiring access that is located above ceilings, other than at acoustical panel ceilings, and that would otherwise not be accessible. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions.

3.4 ACCESS LOCATIONS IN WET AREAS

When possible, avoid locating access panels in wet areas. When such locations cannot be avoided, provide moisture resistant assemblies as indicated in Part I herein.

## 3.5 RECESSED ACCESS DOORS

Install fire-rated access doors in fire-rated partitions and ceilings in accordance with NFPA 80.

## 3.6 FIELD PAINTING

Field painting primed access doors in accordance with the requirements of Section 09 90 00 PAINTS AND COATINGS.

## 3.7 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action.

## 3.8 ADJUSTMENT

Adjust hardware so that door panel opens freely. Adjust door when closed center door panel in frame.

## 3.9 ENVIRONMENTAL CONDITIONS

Do not paint surfaces when damp or exposed to weather, when surface temperature is below 7 degrees C or over 35 degrees C, unless approved by the Contracting Officer.

-- End of Section --

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ALUMINUM SLIDING GLASS DOORS

**08/20**

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SECTION 08 32 13

ALUMINUM SLIDING GLASS DOORS
**08/20**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

| | |
|---|---|
| AAMA/WDMA/CSA 101/I.S.2/A440 | (2011; Update 1 2014) North American Fenestration Standard/Specification for Windows, Doors, and Skylights |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM F842 | (2017) Standard Test Methods for Measuring the Forced Entry Resistance of Sliding Door Assemblies, Excluding Glazing Impact |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1514 | (2015) Test Method of Dew Condensation for Windows and Doorsets |
| JIS H 4040 | (2015) Aluminum and Aluminum Alloy Bars and Wires |
| JIS A 4702 | (2021) Doorsets |
| JIS H 8601 | (1999) Anodic Oxide Coatings on Aluminum and Aluminum Alloys |
| JIS R 3222 | (2003) Heat-Strengthened Glass |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 16 | (2019) Building Construction Standard Specifications - Chapter 16 Opening Construction |

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Aluminum sliding glass doors

SD-10 Operation and Maintenance Data

Aluminum sliding glass doors, Data Package 1; ; G

1.2.1 Shop Drawing Information

Submit drawings for aluminum sliding glass doors, screens, and accessories that indicate elevations of each door type, full size sections, thickness, nominal gages of metal, fastenings, proposed method of installation and anchoring, the size and spacing and method of glazing, details of operating hardware, method and material for weatherstripping, type of finish, and screen details.

1.2.2 Samples Information

Submit color chart of factory color coatings when factory-finished color coating is to be provided.

1.3 TEMPORARY PROTECTIVE COVERING

Prior to shipment from the factory, finished surfaces of aluminum sliding glass doors shall receive a protective covering of waterproof tape, strippable plastic, or cardboard to protect against discoloration and surface damage that may occur during transportation, storage, and construction activities. Also, no coatings or lacquers shall be applied to surfaces to which caulking and glazing compounds must adhere. Covering shall be readily removable after installation.

1.4 DELIVERY AND STORAGE

Inspect aluminum sliding glass doors, including screens, hardware and accessories, for damage and unload and store doors upright on platforms in accessible spaces with a minimum of handling. The storage spaces must be dry, adequately ventilated, free from heavy dust and not subject to combustion products, sources of water or other conditions that could damage the door. Storage spaces must have easy access for inspection and handling of doors.

PART 2 PRODUCTS

2.1 ALUMINUM SLIDING GLASS DOORS

Provide aluminum sliding glass doors with sliding panels and fixed panels in the sizes and arrangements indicated and conforming . Sliding door glazing must be set in aluminum frames and roller assemblies of sufficient strength to withstand lateral live stresses and static load or weight requirements.

2.1.1 Hardware

Sliding door panel must have a manually operated adjustable latch operable by a five-pin tumbler cylinder lock on outside and thumb-turn on the inside. Fit sliding screen door panel with a self-latching hook or rotary-type latch operable from both sides. Exposed hardware is to be aluminum or stainless steel, color finished to match door color finish.

### 2.1.2 Glazing

Factory glazed sliding glass doors, including fixed panel, with double-glazed glass conforming to JIS R 3222 not less than 6 mm thick. Double glazing must have a minimum condensation resistance factor of 64in accordance with JIS A 1514. Glazing material must be certified by independent testing agency. Set glazing unit in polyvinyl-chloride or synthetic rubber glazing channels. Channels must be reusable when replacing glass and have mitered or continuous corners. Channels exposed to view must blend in color with the aluminum frame finish.

### 2.1.3 Weatherstripping

Provide four sides of each sliding panel and interlocking stiles and jambs with weatherstripping. Weatherstripping must conform to JIS A 4702 and must provide maximum protection against the elements and be designed for ease of replacement.

### 2.1.4 Screens

Provide horizontal sliding aluminum screens in combination with aluminum sliding glass doors. Provide screen frames shall consist of aluminum shapes of size and design standard with the door manufacturer. Frames must have removable splines of aluminum or vinyl and must permit screening fabric replacement. Screening shall be 18 by 16 mesh aluminum conforming to JIS H 4040,selected color to match doors. Install screening with weave parallel with frames and sufficiently tight to present a smooth appearance. Conceal edges of screening in the spline channel. Screens must be complete with rollers, hardware, and accessories and must slide on or within tracks provided in the door frame members. Design and assemble doors so that aluminum-to-aluminum contact of moving members will not occur. Provide insect-proofing, formed of wool pile or other suitable material, at interlocking stiles and jambs. Finish on screen frames must be as specified for doors.

### 2.1.5 Finish

Before fabrication, clean sliding glass door units and give a clear (natural) anodized finish in accordance with the requirements of the JIS H 8601. The finish thickness must be 0.01 mm or greater.0.0175 mm or greater.

## 2.2 CAULKING AND SEALING

As specified under Section 07 92 00 JOINT SEALANTS.

## 2.3 FORCED ENTRY RESISTANT DOORS (U.S. PRODUCT ONLY)

In addition to meeting AAMA/WDMA/CSA 101/I.S.2/A440, doors designated forced entry resistant must conform to ASTM F842.

# PART 3 EXECUTION

## 3.1 INSTALLATION

### 3.1.1 Doors, Frames, and Accessories

Install doors, frames, framing members, hardware, and accessories in accordance with approved shop drawings and the requirements specified

herein. Set frames securely anchored in place to straight, plumb, square, level condition without distortion and in alignment. Install door panels to retain proper weathering contact with frames. Caulk metal-to-metal joints between frame members and remove excess material. Caulking around perimeter of door frame and wall openings to provide weathertight installation must be accomplished in accordance with MLIT SS Chapter 16 and manufacturer's recommendations. Finished work shall be rigid, neat in appearance, and free from defects. Upon completion, adjust sliding doors to operate properly. Thoroughly clean aluminum frames and glass in accordance with manufacturer's recommendation. Doors damaged prior to completion and acceptance must be restored to original manufactured condition or replaced with new doors as directed.

### 3.1.2 Protection of Aluminum from Dissimilar Materials

#### 3.1.2.1 Aluminum to Dissimilar Metals

Prevent aluminum surfaces from contacting dissimilar metals other than stainless steel, zinc, or white bronze by one or a combination of the following:

a. Paint dissimilar metal with one coat of heavy-bodied bituminous paint.

b. Apply caulking between aluminum and dissimilar metal.

c. Paint dissimilar metal with primer, followed by one coat of aluminum paint or other suitable lead-free coating.

d. Use nonabsorptive tape or gasket in permanently dry locations.

#### 3.1.2.2 Drainage from Dissimilar Metals

Paint dissimilar metals located in areas where their drainage washes over aluminum to prevent the staining of aluminum.

#### 3.1.2.3 Aluminum to Masonry and Concrete

Prevent aluminum surfaces from coming into contact with mortar, concrete, or other masonry materials by applying one coat of heavy-bodied bituminous paint to the aluminum surfaces.

#### 3.1.2.4 Aluminum to Wood

Prevent aluminum surfaces from coming into contact with wood, treated wood, or similarly absorptive materials by one or a combination of the following methods:

a. Paint aluminum surfaces with two coats of aluminum paint or one coat of heavy-bodied bituminous paint.

b. Paint the wood, treated wood, or other absorptive surfaces with two coats of aluminum paint and seal contiguous joints with caulking compound.

-- End of Section --

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**05/19**

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-- End of Section Table of Contents --

# SECTION 08 51 13

# ALUMINUM WINDOWS
**05/19**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E1886 | (2019) Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials |
| ASTM E1996 | (2017) Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes |
| ASTM F2090 | (2021) Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms |
| ASTM F2006 | Standard Safety Specification for Window Fall Prevention Devices for Non-Emergency Escape (Egress) and Rescue (Ingress) Windows |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1514 | (2015) Test Method of Dew Condensation for Windows and Doorsets |
| JIS A 1516 | (1998) Windows and Doorsets - Air Permeability Test |
| JIS A 1517 | (1996) Windows and Doorsets-Watertightness Test Under Dynamic |
| JIS A 4706 | (2015) Windows |
| JIS A 4709 | (2018) Screens for windows |
| JIS B 1220 | (2015) Set of Anchor Bolt for Structures |
| JIS B 1051 | (2014) Coarse And Fine Screws Mechanical Properties of Fasteners Made of Carbon Steel and Alloy Steel Bolts, Screws and Studs with Specified Property |

| | |
|---|---|
| | Classes-Coarse Thread and Fine Pitch Thread |
| JIS H 8601 | (1999) Anodic Oxide Coatings on Aluminum and Aluminum Alloys |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 16 | (2019) Building Construction Standard Specifications - Chapter 16 Opening Construction |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| UFC 4-020-01 | (2008) DoD Security Engineering Facilities Planning Manual |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows; G

Fabrication Drawings

SD-03 Product Data

Window Fall Prevention Screens; G

SD-06 Test Reports

Windborne-Debris-Impact Performance

SD-10 Operation and Maintenance Data

Windows, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## 1.3 QUALITY ASSURANCE

### 1.3.1 Qualification of Manufacturer

Window manufacturer must specialize in designing and manufacturing the type of aluminum windows specified in this section, and have a minimum of 5 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

### 1.3.2 Shop Drawing Requirements

Take field measurements prior to preparation of drawings and fabrications. Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, mullion details, method and materials for weatherstripping, material and method of attaching subframes, stools, casings, sills, trim, installation details, and other related items.

### 1.3.3 Engineer's Qualifications for Blast Design

All blast design calculations must be performed by or under the direct supervision of a registered engineer with a minimum of 5 years experience performing blast design. The engineer performing the blast design must be able to demonstrate experience on similar size projects using similar design methods to meet the requirements outlined in this specification.

### 1.3.4 Sample Requirements

#### 1.3.4.1 Finish Sample Requirements

Submit color chart of standard factory color coatings when factory-finish color coating is to be provided.

#### 1.3.4.2 Window Sample Requirements

Submit one full-size corner of each window type proposed for use. Where screens or weatherstripping is required, fit sample with such items that are to be used, only required for large scale projects with numerous windows.

### 1.3.5 Design Data Requirements

Submit calculations to substantiate compliance with deflection requirements. A registered Professional Engineer must provide calculations.

Calculations verifying the structural performance of each window proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the window components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.

### 1.3.6 Test Report Requirements

Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein by independent testing agency including test size, and minimum condensation resistance factor (CRF).

Submit documentation providing compliance with ASTM F2006 and ASTM F2090, including test reports from suppliers or manufacturers.

### 1.3.7 Certification

Ensure that construction is performed with products that meet or exceed JIS A 4706 requirement.

Each prime window unit must demonstrate that the product complies with JIS A 4706. Certified test reports attesting that the prime window units meet the requirements of JIS A 4706, including test size, will be acceptable in lieu of product labeling.

Certification of Compliance: Submit certificates from the window manufacturer or WFPD supplier verifying that installed window fall prevention devices meet ASTM F2006 and ASTM F2090, as applicable, for the specific window types.

## 1.4 DELIVERY AND STORAGE

Deliver windows to project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, or otherwise damaging the windows. Repair damaged windows to an "as new" condition as approved. If windows can not be repaired, provide a new unit.

## 1.5 PERFORMANCE REQUIREMENTS

### 1.5.1 Wind Loading Design Pressure

Design window components, including mullions, hardware, and anchors, to withstand a wind-loading design pressure of at least as indicated in the structrual drawings.

### 1.5.2 Tests

Perform tests by a nationally recognized independent testing laboratory equipped and capable of performing the required tests. Submit the results of the tests as certified laboratory reports required herein. For Japanese manufactured windows, provide structural calculations to prove compliance.

Minimum design load for a uniform-load structural test must be 2400 pascal.

Perform impact testing of fall protection screens in accordance with ASTM F2006 and ASTM F2090.

## 1.6 DRAWINGS

Submit the Fabrication Drawings for aluminum window units showing complete window assembly including hardware, weatherstripping, and subframe assembly details.

## 1.7 WINDOW PERFORMANCE

Aluminum windows must meet the following performance requirements. Perform testing requirements by an independent testing laboratory or agency.

### 1.7.1 Structural Performance

Structural test pressures on window units must be for positive load (inward) and negative load (outward). After testing, there will be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There must be no permanent deformation of any main frame, sash or ventilator member for the window types and classification

specified in this section.

1.7.2 Air Infiltration

Air infiltration must not exceed the amount established by JIS A 1516 for each window type.

1.7.3 Water Penetration

Water penetration must not exceed the amount established by JIS A 1517 for each window type.

1.7.4 Thermal Performance

Windows shall meet specified Solar Heat Gain Coefficient (SHGC) and Visual Transmittance (VT) or greater.

1.7.4.1 Southern Climate

Windows installed in Climate Zone 2 will have a U-Factor of 1.3 $W/m^{2\cdot}°C$ or less and a SHGC of 0.25 or less.

1.7.5 Windborne-Debris-Impact Performance

Exterior window system including glazing must comply with indicated basis or enhanced protection testing requirements in ASTM E1996 for Wind Zone 4 when tested according to ASTM E1886. Test specimens must be no smaller in width and length than glazing indicated for use on Project and must be installed in same manner as glazing indicated for use on Project.

a. Refer to drawings for classification of window requiring basic or enhanced protection.

1.8 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with MLIT SS Chapter 16, JIS A 4706 and the requirements specified herein. In addition to compliance with JIS A 4706, window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures. Provide Structural calculations for deflection to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified. Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide windows with insulating glass and thermal break necessary to achieve a minimum Condensation Resistance Factor (CRF) of 50 when tested in accordance with JIS A 1514. Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with JIS B 1051, or other corrosion-resistant material compatible with adjacent

materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

2.1.1 Horizontal Sliding Windows (HS)

Type HS- (Optional Performance Grade).

2.1.2 Fixed Windows (F)

Type F- - (Optional Performance Grade).

2.1.3 Forced Entry Resistant Windows

In addition to meeting the requirements of JIS A 4706, windows designated for resistance to forced entry must conform to the requirements per UFC 4-020-01 as applicable.

2.1.4 Glass and Glazing

Materials are specified in Section 08 81 00 GLAZING.

2.1.5 Caulking and Sealing

Are specified in Section 07 92 00 JOINT SEALANTS.

2.1.6 Weatherstripping

JIS A 4706. Provide for all ventilating (operable) sash for all windows. Provide woven wool pile weatherstripping 5.3 millimeter thick, or polypropylene multifilament fiber weatherstripping installed in an integral weatherstripping groove in the sash or frame, and flexible polyvinylchloride weatherstripping installed in the sill member.

2.1.7 Window Fall Prevention Screens

In addition to meeting the requirements of JIS A 4706 and JIS A 4709, Window fall prevention screens shall comply with ASTM F2006 and ASTM F2090.

Window fall prevention devices shall be installed in such manner that no space shall exist anywhere in the window opening with window fall prevention device installed that would permit the passage of a rigid sphere measuring 102 mm in diameter.

2.2 FABRICATION

Fabrication of window units must comply with JIS A 4706.

2.2.1 Fasteners

Use window manufacturer's standard for windows, trim, and accessories. Self-tapping sheet-metal screws are not acceptable for material more than 2 mm thick.

2.2.2 Adhesives

Provide joint sealants as specified in Section 07 92 00 JOINT SEALANTS. For interior application of joint sealants, comply with applicable regulations regarding reduced VOC's, and as specified in Section 07 92 00 JOINT SEALANTS.

### 2.2.3 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside.

### 2.2.4 Combination Windows

Windows used in combination must be factory assembled of the same class and grade. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

### 2.2.5 Mullions and Transom Bars

Provide mullions with a thermal break. Secure mullions and transom bars to adjoining construction and window units in such a manner as to permit expansion and contraction and to form a weathertight joint. Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.

### 2.2.6 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation.

#### 2.2.6.1 Hardware

The item, type, and functional characteristics must be the manufacturer's standard for the particular window type. Provide stainless steel hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip all operating ventilators with a lock or latching device which can be secured from the inside.

#### 2.2.6.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 150 mm from each end and at midpoint.

#### 2.2.6.3 Window Anchors

Anchoring devices for installing windows must be made of aluminum or stainless steel, or zinc-plated steel conforming to JIS B 1220.

### 2.2.7 Finishes

Comply with JIS H 8601 for applying and designating finishes. Exposed aluminum surfaces must be factory finished with an anodic coating or organic coating. Color must be as indicated. All windows must have the same finish.

2.2.7.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to JIS H 8601. Finish shall be selected from JIS standard.

2.2.8 Screens

Provide one insect screen for each operable exterior sash or ventilator. Design screens to be rewirable, easily removable from inside the building, and to permit easy access to operating hardware. Manufacturers standard aluminum frame complying with JIS A 4709. Fabricate frames with mitered or coped joints or corner extrusion, concealed fasteners and removable PVC spline/anchors concealing edge of frame.

2.2.8.1 Insect Screen

Insect screen mesh to be aluminum wire fabric, 18x16 mesh of 0.2794 mm diameter coated aluminum wire.

2.2.9 Window Fall Prevention Screen

Provide Aluminum Frame Screen with stainless steel screen mesh that will fulfill the requirements of Maintenance, Security and Child Safety. Constructed with a profile, that will make it possible to replace existing window screens in majority of the windows.

Materials
All sections of the screen shall be an Extruded Aluminum solid profile of a 6063-T Alloy. Wire Cloth shall be standard tensile strength stainless steel alloy #304, 0.58 mm or 0.71 mm diameter. Frame profile shall not exceed 6.35 mm at track insertion point. Mounting flanges will be constructed of 1.24 mm aluminum.

Construction
The frame shall be cut with a mitered corner construction. The screen material shall be compressed into the jaw of the frame material and the frame miters will be welded. The screen material shall be held in place in the pressed area of the screen frame by the design of the aluminum extrusion.

Finish
Polyester Powder Coat paint finish shall be electrostatically applied, and baked for a minimum of 15 minutes at 205 degrees C. Powder coat paint finish shall be a minimum of 1.5 mil thickness.

Provide window fall prevention devices complying with ASTM F2006 and ASTM F2090 for operable windows as noted on the drawings.

Window Fall prevention devices shall be tested, labeled, and installed to meet all requirements of the referenced ASTM standards. Partial compliance is not permitted.

Devices per ASTM F2006 and ASTM F2090 (e.g., window guards or specialized screens) shall be designed for non-egress windows.

Submit manufacturer’s test reports verifying compliance with ASTM F2006 and ASTM F2090 for the specific window operator type, whether factory-installed or provided as a field-installed kit.

## 2.3 THERMAL-BARRIER WINDOWS

Provide thermal-barrier windows, complete with accessories and fittings, where indicated.

Specify material and construction except as follows:

a. Aluminum alloy must be 6063-T6.

b. Frame construction, including operable sash, must be factory-assembled and factory-sealed inner and outer aluminum completely separated from metal-to-metal contact. Join assembly by a continuous, concealed, low conductance divider housed in an interlocking extrusion of the inner frame. Metal fasteners, straps, or anchors must not bridge the connection between the inner and outer frame.

c. Operating hardware for each sash must consist of spring-loaded nylon cushion blocks and pin locks designed to lock in predetermined locations.

d. Sash must be completely separated from metal-to-metal contact by means of woven-pile weatherstripping, plastic, or elastomeric separation members.

e. Operating and storm sash must be factory-glazed with the type of glass indicated and of the quality specified in Section 08 81 00 GLAZING.

## 2.4 MULLIONS

Provide mullions between multiple-window units where indicated.

Provide profiles for mullions and mullion covers, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members must be fabricated of the materials specified and meet the specified design loading.

## 2.5 WINDOW CLEANERS' BOLTS

Provide window cleaners' bolts for all windows 2100 millimeter or higher above finished grade, except for windows that can be removed and cleaned from the ground or from a lower roof level without the use of an extension ladder. Provide two bolts for each single window unit and each fixed glass unit. Locate bolts 1120 millimeter above the window sill.

Window cleaners' bolts must be double-head type, corrosion-resistant steel, size and design per manufacturer. Contact side of the bolts must be ground to fit flat against window jambs. Bolts must be factory- or field-attached before windows are set. Reinforce backs of frames to receive bolts with 6 by 150 millimeter corrosion-resistant steel or

aluminum plates bolted or welded to the frames at the factory. Special wall anchors must be provided on frames at the point of bolt attachment.

# PART 3 EXECUTION

## 3.1 INSTALLATION

### 3.1.1 Method of Installation

Install in accordance with the window manufacturer's printed instructions and details. Build in windows as the work progresses or install without forcing into prepared window openings. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and caulk windows in a manner that will prevent entrance of water and wind. Fasten insect screens securely in place.

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

### 3.1.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials. Do not coat surfaces in contact with sealants after installation with any type of protective material. Do not apply coatings or lacquers to surfaces to which caulking and glazing components must adhere.

### 3.1.3 Anchors and Fastenings

Make provision for securing units to each other, to masonry, and to other adjoining construction. Windows installed in masonry walls must have head and jamb members designed to recess into masonry wall not less than 11 mm.

### 3.1.4 Adjustments After Installation

After installation of windows and completion of glazing and field painting, adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Verify that products are properly installed, connected, and adjusted.

## 3.2 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware. Replace all stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

-- End of Section --

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SECTION 08 71 00

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# SECTION 08 71 00

# DOOR HARDWARE
**02/16**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1510-2 | (2019) Test Method for Door Fittings - Part 2: Fittings for Doors |
| JIS A 1510-3 | (2001) Test Methods for Door Fittings - Part 3: Floor Concealed Door Closers, Door Closers and Hinge Closers |
| JIS A 1516 | (1998) Windows and Doorsets - Air Permeability Test |
| JIS A 1541-1 | (2016) Building Hardware - Locks and Latches - Part 1: Test Methods for Locks and Latches |
| JIS A 1541-2 | (2016) Building Hardware - Locks and Latches - Part 2: Methods of the Presentation and Grade of Criteria for Practical Performance Item |
| JIS A 1525 | (1996) Doorsets - Repeated and Opening and Closing Test |
| JIS A 4702 | (2021) Doorsets |
| JIS A 5756 | (2013) Preformed Gaskets Used in Buildings - Classification, Specifications and Test Methods |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 101 | (2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code |
| NFPA 252 | (2022) Standard Methods of Fire Tests of Door Assemblies |
| NFPA 70 | (2023) National Electrical Code |
| NFPA 72 | (2022; ERTA 22-1) National Fire Alarm and Signaling Code |

| | |
|---|---|
| NFPA 80 | (2022) Standard for Fire Doors and Other Opening Protectives |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 36 CFR 1191 | Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL Bld Mat Dir | (updated continuously online) Building Materials Directory |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G

Verification of Existing Conditions; G

Hardware Schedule; G

Keying System; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G

SD-11 Closeout Submittals

Key Bitting

## 1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly components and interface with adjacent construction. Base shop drawings on verified field measurements and include verification of existing conditions.

## 1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by 36 CFR 1191 Appendix D - Technical.

## 1.5 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

| Hardware Item | Quantity | Size | Reference Publi-cation Type No. | Finish | Mfr Name and Catalog No. | Key Control Symbols | UL Mark (If fire-rated and listed) | BHMA Finish Desig-nation |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

In addition, submit hardware schedule data package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## 1.6 KEY BITTING CHART REQUIREMENTS

### 1.6.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

a. Complete listing of all keys.

b. Complete listing of all key cuts.

c. Tabulation showing which key fits which door.

d. Copy of floor plan showing doors and door numbers.

e. Listing of 20 percent more key cuts than are presently required in each master system.

## 1.7 QUALITY ASSURANCE

### 1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

### 1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

## 1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

# PART 2 PRODUCTS

## 2.1 TEMPLATE HARDWARE

Hardware applied to metal doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with JIS A 1510-2 for template hinges. Coordinate hardware items to prevent interference with other hardware.

## 2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

## 2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

### 2.3.1 Hinges

Provide in accordance with JIS A 1510-3. Provide hinges that are 114 by 114 mm unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

### 2.3.2 Continuous Hinges

Where continuous hinges are required, provide in accordance with JIS A 1510-2.

### 2.3.3 Locks and Latches

a. At exterior locations provide locksets of full stainless steel type 302 or 304 construction including fronts, strike, escutcheons, knobs, bolts and all interior working parts. Marine Grade I, fully non-ferrous.

b. In non-air-conditioned interior environments or humid interior environments, provide interior locksets on the same Marine Grade I, fully non-ferrous as exterior locksets.

#### 2.3.3.1 Mortise Locks and Latches

Provide in accordance with JIS A 1541-1. Provide knobs and roses of mortise locks with screwless shanks and no exposed screws.

2.3.3.2 Bored Locks and Latches

Provide in accordance with JIS A 4702.

2.3.3.3 Residential Bored Locks and Latches

Provide in accordance with JIS A 4702. Install locks for exterior doors with threaded roses or concealed machine screws.

2.3.4 Exit Devices

Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms. Provide escutcheons not less than 178 by 57 mm.

Use stainless steel or bronze base metal with plated finishes. Also include stainless steel fasteners and screws.

2.3.5 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer.

2.3.5.1 High Security Cylinders

Provide high security cylinder with locking technology that limits the duplication of unauthorized keys or unauthorized electronic credentials that would operate the locks. High security cylinder must be able to stand up to forcing, drilling, sawing, prying, pulling, plug driving, picking and have corrosion resistance. .

2.3.6 Push Button Mechanisms

Provide in accordance with JIS A 1541-1.

2.3.7 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

2.3.7.1 Electric Strikes and Frame Mounted Actuators

Provide electric strikes and actuators as required to meet operational requirements. Provide electric strikes that remain secure during power failure. Provide a separate power supply for electric strikes, other locking devices and ancillary parts. Provide strikes and actuators with a minimum opening force of 101 kilonewtons (kN).

Provide facility interface devices that use direct current (dc) power to energize the solenoids. Provide electric strikes and actuators that incorporate end-of-line resistors to facilitate line supervision by the system. If not incorporated into the electric strike or local controller, provide metal oxide resistors (MOVs) to protect the controller from reverse current surges.

2.3.7.1.1 Solenoid

Provide actuating solenoid for strikes and actuators that are rated for

continuous duty, cannot dissipate more than 12 Watts and must operate on 12 or 24 Volts dc. Inrush current cannot exceed 1 ampere and the holding current cannot be greater than 500 milliamperes. Actuating solenoid must move from fully secure to fully open positions in less than 500 milliseconds.

2.3.7.1.2 Signal Switches

Provide strikes and actuators with signal switches to indicate to the system when the bolt is not engaged or the strike mechanism is unlocked. Signal switches must report a forced entry to the system.

2.3.7.1.3 Coordination

Provide electric strikes and actuators of a size, weight and profile compatible with each specified door frame. Field verify installation clearances prior to procurement.

2.3.7.1.4 Mounting Method

Provide electric strikes and actuators suitable for use with single and double doors, with mortise or rim type hardware specified, and for right or left hand mounting as specified. In double door installations, locate the lock in the active leaf and monitor the fixed leaf.

2.3.7.2 Release Devices

In accordance with JIS A 1510-3.

2.3.8 Keying System

Provide a master keying system Provide construction interchangeable cores. Provide key cabinet as specified.

2.3.9 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.9.1 Knobs and Roses

Provide in accordance with JIS A 4702 and JIS A 1541-1 for knobs, roses, and escutcheons. For unreinforced knobs, roses, and escutcheons, provide a 1.25 mm thickness. For reinforced knobs, roses, and escutcheons, provide an outer shell thickness of 0.89 mm and a combined total thickness of 1.78 mm, except at knob shanks. Provide knob shanks 1.52 mm thick.

2.3.9.2 Lever Handles

Provide lever handles . Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in JIS A 1541-1 is applied to the lever handle. Provide lever handles return to within 13 mm of the door face.

2.3.9.3 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

2.3.10 Keys

Furnish one file key, one duplicate key, and one working key for each key change and for each master keying system. Furnish one additional working key for each lock of each keyed-alike group. Furnish two great grand master keys, two construction master keys, and two control keys for removable cores. Stamp each key with appropriate key control symbol and "U.S. property - do not duplicate." Do not place room number on keys.

2.3.11 Door Bolts

Provide in accordance with JIS A 4702. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide flush bolts as specified to meet operational requirements.

2.3.12 Closers

Provide in accordance with JIS A 1510-3. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

Use stainless steel inside bracketed or door mounted closers on exterior doors. Non-ferrous closers, such as aluminum or cast bronze, are permissible where door utilization is minimal. On interior doors use closers of 302 or 304 stainless steel or non-ferrous materials. On surface-mounted closers use or apply rust inhibiting finish on all ferrous parts. Also apply this finish on concealed closers.

2.3.12.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

2.3.13 Overhead Holders

Provide in accordance with JIS A 1510-3.

2.3.14 Door Protection Plates

Provide in accordance with JIS A 4702.

2.3.14.1 Sizes of Kick Plates

50 mm less than door width for single doors; 25 mm less than door width for pairs of doors. Provide 200 mm kick plates for flush doors

2.3.15 Door Stops and Silencers

Provide in accordance with JIS A 4702. Provide three silencers for each single door, two for each pair.

2.3.16 Padlocks

Provide padlock of solid extruded brass . Shackle to be cut-resistant.

Provide lock functions consisting of non-key retained, weather cover, .

2.3.17 Thresholds

Use vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.18 Weatherstripping Gasketing

Provide in accordance with JIS A 5756. Provide the type and function designation where specified in paragraph HARDWARE SCHEDULE. Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weatherstripped doors not to exceed 2.19 by 10-5 cms per minute of air per square meter of door area when tested in accordance with JIS A 1516. Provide weatherstripping with one of the following:

2.3.18.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 1.25 mm wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.18.2 Interlocking Type

Zinc or bronze not less than 0.45 mm thick.

2.3.18.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.20 mm thick.

2.3.19 Gasketing

Provide in accordance with JIS A 5756. Provide adjustable doorstops at heads,jambs and automatic door bottoms in accordance with the hardware set, of extruded aluminum, clear (natural) anodized, surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed cell sponge gasket. Provide door bottoms with adjustable operating rod and silicone rubber or closed cell sponge neoprene gasket. Provide doorstops that are mitered at corners. Provide type and function designation where specified in paragraph HARDWARE SETS.

2.3.20 Rain Drips

Provide extruded aluminum rain drips, not less than 2.03 mm thick, clear anodized finish. Provide the manufacturer's full range of color choices to the Contracting Officer for color selection. Provide rain drips with a 102 mm overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

2.3.20.1 Door Rain Drips

Approximately 38 mm high by 16 mm projection. Align bottom with bottom edge of door.

2.3.20.2 Overhead Rain Drips

Approximately 38 mm high by 64 mm projection. Align bottom with door frame rabbet.

2.3.21 Auxiliary Hardware (Other than locks)

Provide in accordance with JIS A 4702.

2.3.22 Sliding and Folding Door Hardware

Provide in accordance with JIS A 1525. Finishes to match other hardware specified herein.

2.3.23 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with JIS A 1541-2. Provide hardware in satin stainless steel, unless specified otherwise. Provide items not manufactured in stainless steel in satin chromium plated over brass or bronze, except aluminum paint finish for surface door closers, and except satin chromium plated for steel hinges. Provide hinges for exterior doors in stainless steel finish . Furnish exit devices in satin chrome finish in lieu of stainless steel finish . Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with project requirements, Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 225 mm on center after doors and frames have been finish painted.

3.1.1.2 Interlocking Type Weatherstripping

Provide interlocking, self adjusting type on heads and jambs and flexible hook type at sills. Nail weatherstripping to door 25 mm on center and to heads and jambs at 100 mm on center.

3.1.1.3 Spring Tension Type Weatherstripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze. Provide stainless steel nails with stainless steel. Space nails not more than 38 mm on center.

3.1.2 Installation

Provide as specified for stop applied weatherstripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies. .

3.3 HARDWARE LOCATIONS

Provide as indicated or specified otherwise.

a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.

b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

## 3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

## 3.6 HARDWARE SETS

Provide hardware for aluminum doors under this section. Deliver Hardware templates and hardware, except field applied hardware, to the aluminum door and frame manufacturer for use in fabricating doors and frames.

HW-1

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 1 ea | CONT HINGE | Edge-mounted Gear-Type Grade | 628 |
| 1 ea | LOCKSET | F86 (Store room function with dead locking latch bolt Grade 2) | 626 |
| 1 set | SEALS | R3E165 (Silicon rubber gasketing / Applied to Frame soffit / Head and jamb / Aluminum retainer / Rating 5) | |
| 1 ea | THRESHOLD | J32100 (Fluted Surface Thresholds / Flat Saddle / Aluminum) | 628 |
| 1 ea | DOOR BOTTOM | R3A535 (Door Sweep or shoe with drip cap / Brush gasketing / Aluminum retainer/ Applied to door face) | 628 |
| 1 ea | STOP | L02121 Wall type post stop with rubber bumper and hold-open | 626 |

| | | | |
|---|---|---|---|
| 1 ea | CLOSER | C05052 (Overhead concealed closer / w/hold open / Grade 2) | |

HW-2
SLIDING GLASS DOOR
HARDWARE BY DOOR COVER MANUFACTURER

HW-3

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 3 ea | HINGES | A5111 Full Mortise Hinge / Hvy Wgt / Ball Bearing / 5 Knuckles / Grade 1 / Stainless Steel) (114mm x 114mm) | 630 |
| 1 ea | LOCKSET | F86 (Store room function with dead locking latch bolt Grade 2) | 626 |
| 1 ea | THRESHOLD | J32100 (Fluted Surface Thresholds / Flat Saddle / Aluminum) | 628 |
| 1 ea | CLOSER | C02011 OR 2021, (Surface closer, Modern type with cover, Grade 1) PT4D&H | 689 |
| 1 set | SEALS | R3E165 (Silicon rubber gasketing / Applied to Frame soffit / Head and jamb / Aluminum retainer / Rating 5) | |
| 1 ea | KICK PLATE | J102 (254mm HIGH MIN) | 630 |

| | | | |
|---|---|---|---|
| 1 ea | DOOR BOTTOM | R3A434 (Door sweep or shoe with drip cap / Applied to door face / Brush gasketing / Aluminum retainer / Rating 4) | 628/626 |
| 1 ea | STOP | L02101 (Door-mounted stop with rubber cushion | 626 |

HW-4

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 1 | Continuous Hinge | CFM__HD1 Continuous Geared Hinge Full-Mortise Heavy Duty Clear Anodized Finish Fire Rated - UL10C | |
| 1 | Exit device | 12 19 43 8804 Exit Device with Key Retractable Latchbolt | US32D |
| 1 | Pull | RM3310-48 | US32D |
| 1 | Closer | CLP7500 | 689 |
| 1 | Door Gasketing | By Door Mfg | |
| 1 | Door Sweep | 345APK | |
| 1 | Threshold | 252X3AFG | |

HW-5

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 3 | Hinges | TA2314 4-1/2 X 4-1/2 | US32D |
| 1 | Exit device | 12 19 43 8813 X ETB | US32D |
| 1 | Closer | 7500 | 689 |
| 1 | Door Gasketing | S88BKL | |

HW-6

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 2 | Continuous Hinge | CFM__HD1 | |
| 1 | Exit device | 19 43 8904 X ETB | US32D |
| 2 | Flush Bolts | 555 | US26D |
| 1 | Closer | CLP7500 | 689 |
| 1 | Overhead Stop | 1-336 | 630 |
| 1 | Door Gasketing | By Door Mfg | |
| 1 | Astragal | 355AS | |
| 2 | Door Sweep | 345APK | |
| 1 | Threshold | 252X3AFG | |

HW-7

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 1 | Continuous Hinge | CFM__HD1 | |
| 1 | Continuous Hinge | CFM__HD1 EPT | |
| 1 | Power Transfer | CEPT | |
| 1 | ELR Exit device | 19 43 56 8904 X ETB | US32D |
| 2 | Flush Bolts | 555 | US26D |
| 1 | Automatic Operator | 6000 Series | 689 |
| 1 | Overhead Stop | 1-336 | 630 |
| 1 | Door Gasketing | By Door Mfg | |
| 1 | Astragal | 355AS | |
| 2 | Door Sweep | 345APK | |
| 1 | Threshold | 252X3AFG | |
| 1 | ElectroLynx Cable | QC-C006 | |
| 1 | ElectroLynx Cable | QC-C2500P | |
| 2 | Activation Switches | 503 | |

Note: Coordinate voltage, operation and electrical characteristics with all related trades.

HW-8

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 2 | Continuous Hinge | CFM__HD1 | |
| 1 | Exit device | 19 43 AD8606 X 106 | US32D |
| 2 | Exit device | 19 43 AD8610 | US32D |
| 1 | Pull | RM3310-48 | US32D |
| 1 | Closer | CLP7500 | 689 |
| 1 | Door Gasketing | By Door Mfg | |
| 1 | Astragal | 355AS | |
| 2 | Door Sweep | 345APK | |
| 1 | Threshold | 252X3AFG | |

HW-9

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 3 | Hinges | TA2314 4-1/2 X 4-1/2 | US32D |
| 1 | Exit device | 12 19 43 8815 X ETB | US32D |
| 1 | Closer | 7500 | 689 |
| 1 | Door Gasketing | S88BKL | |
| 1 | Wall Stop | 406 | 630 |

HW-10

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 3 | HINGES | A2132 (Wrought brass or bronze / Full mortised hinges / Plain bearing / Grade 2)(89 mm by 89 mm) | 626 |

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 1 ea | PRIVACY SET | F76 (Latch bolt operated by lever from either side. Outside lever is locked by push button ot other locking device inside and unlocked by emergency release outside, operating inside lever or closing door.), Grade 2 | 628 |
| 1 ea | STOP | L02101 (Door-mounted stop with rubber cushion) | 626 |

HW-11

| QTY. | Item | Description | Finish |
|---|---|---|---|
| 3 | HINGES | A5112 (Full Mortise Hinge / Std Wgt / Ball Bearing / 5 Knuckles / Grade 2 / Stainless Steel) NRP (114 mm by 114 mm) | 630 |

| | | | |
|---|---|---|---|
| 1 ea | LOCKSET | F82 (Dead locking latch bolt operated by lever from either side, except when outside lever is locked by push button or other locking device inside. When outside lever is locked, operating key in outside lever or operating inside lever unlocks push button or other locking device and retracts latch bolt. Closing door does not release push button or other locking device.) Grade 2 | 626 |
| 1 ea | DEADLOCK | E0152 (Dead bolt operated by key from outside and by turn from inside.) | 626 |
| 1 ea | CLOSER | C05052 (Overhead concealed closer / w/hold open / Grade 2) | |
| 1 | Door Gasketing | By Door Mfg | |
| 1 ea | THRESHOLD | J32100 (Fluted Surface Thresholds / Flat Saddle / Aluminum) | 628 |
| 1 ea | VIEWER | LO3221 190 degrees w/optical glass lens | 626 |

| | | | |
|---|---|---|---|
| 1 ea | DOOR STOP | L02121 Wall type post stop with rubber bumper and hold-open | 626 |

See drawings for Hardware Sets, Hardware Products, and Door Operational Functions.

-- End of Section --

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SECTION 08 81 00

GLAZING

**05/19**

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# SECTION 08 81 00

# GLAZING
**05/19**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

| | |
|---|---|
| ASCE 7 | (2017) Minimum Design Loads for Buildings and Other Structures |

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

| | |
|---|---|
| ISO 15099 | (2003) Thermal Performance of Windows, Doors and Shading Devices - Detailed Calculations |
| ISO 16932 | (2007) Glass in Buildings - Destructive Windstorm-Resistant Security Glazing - Test and Clarification |
| ISO 28278 | (2011) Glass in Building - Glass Products for Structural Sealant Glazing |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1304 | (2017) Method of Fire Resistance Test for Elements of Building Construction |
| JIS A 1439 | (2016) Testing Methods of Sealants for Sealing and Glazing in Buildings |
| JIS A 5756 | (2013) Preformed Gaskets Used in Buildings - Classification, Specifications and Test Methods |
| JIS A 5758 | (2016) Sealants for Sealing and Glazing in Buildings |
| JIS K 6262 | (2013) Rubber, Vulcanized or Thermoplastic - Determination of Compression Set at Ambient, Elevated or Low Temperatures |
| JIS K 7366 | (1999) Plastic-plasticized polyvinyl chloride (PVC-P) Molding and extrusion materials |
| JIS R 3109 | (2018) Glass in Building - Destructive-Windstorm-Resistant Security Glazing - Test Method |

| | |
|---|---|
| JIS R 3202 | (2011) Float Glass and Polished Plate Glass |
| JIS R 3205 | (2005) Laminated Glass |
| JIS R 3206 | (2014) Tempered Glass |
| JIS R 3221 | (2002) Solar Reflective Glass |
| JIS R 3222 | (2003) Heat-Strengthened Glass |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT-SS Ch 16, Sec 14 | (2019) Building Construction Standard Specifications - Chapter 16 Openings Construction, Section 14 Glazing |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 252 | (2022) Standard Methods of Fire Tests of Door Assemblies |
| NFPA 257 | (2012; ERTA 2017) Standard on Fire Test for Window and Glass Block Assemblies |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 16 CFR 1201 | Safety Standard for Architectural Glazing Materials |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulating Glass

Sealants

Joint Backer

SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting

SD-11 Closeout Submittals

Warranty for Insulated Glass Units

## 1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, or defects in the work. Glazed panels must comply with the safety standards, in accordance with JIS R 3205 for Laminated Glass or JIS R 3206 for Tempered Glass, comply with indicated wind/snow loading in accordance with ISO 28278, and relative displacement requirements in accordance with ASCE 7, section 13.5.9.1. Provide insulated laminated heat-strengthened exterior glazing with a minimum interlayer thickness as indicated on the drawings or as required to meet performance requirements.

### 1.3.1 Wind Pressure Requirements

Exterior glazing to withstand an allowable wind-loading design pressures as indicated in the structural drawings defined by ASCE 7-10.

### 1.3.2 Windborne Debris Requirement

Exterior glazing shall be tested and certified for impact resistance with the window or door as applicable under JIS R 3109 to comply with ICC IBC Section 1609, Wind Loads or tested and certified for impact resistance under ISO 16932 to comply with and Wind Zone 4___.

## 1.4 QUALITY CONTROL

Submit two 203 by 254 mm samples of each of the following: tinted glass, and insulating glass units.

Submit three samples of each other material.

## 1.5 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

## 1.6 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 4 degrees C and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

## 1.7 WARRANTY

### 1.7.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the

Government.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

2.1.1 Energy Efficient Equipment for Residential Windows

Provide energy efficient residential windows in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph ENERGY EFFICIENT PRODUCTS.

2.2 GLASS

JIS R 3202, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.2.1 Clear Glass

Provide for glazing openings not indicated or specified otherwise. Use double-strength sheet glass or 3 mm float glass for openings up to and including 1.39 square meters, 4.5 mm for glazing openings over 1.39 square meters but not over 2.79 square meters, and 6 mm for glazing openings over 2.79 square meters but not over 4.18 square meters.

2.2.2 Annealed Glass

Annealed glass must be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, 70 percent light transmittance, 0.40 percent shading coefficient, conforming to JIS R 3202.

2.2.3 Heat-Absorbing Glass

6 mm thick, green in color, 70 percent light transmittance, 0.40 percent shading coefficient, conforming to JIS R 3202.2.2.4 Reflective Coating Vision Glass

JIS R 3221.

2.2.5 Laminated Glass

JIS R 3205, Laminated glass fabricated from two nominal 3 mm pieces of flat annealed ultraclearglass conforming to JIS R 3202. JIS R 3205, Laminated glass fabricated from two nominal 3 mm pieces of HS, flat heat strengthened clear glass conforming to JIS R 3222. Flat glass to be laminated together with a minimum of 0.75 mm mm thick, clear polyvinyl butyralcast-in-place liquid resin laminate, conforming to requirements of JIS R 3205. The total thickness of nominally 6 mm. Color to be clear. The total thickness of nominally 6 mm.

2.2.6 Tempered Glass

Per fully tempered, uncoated, transparent per JIS R 3222 as specified in the drawings conforming to JIS R 3206 or MLIT-SS Ch 16, Sec 14. Color must be as specified in the drawings. Provide wherever safety glazing material is indicated or specified.

2.2.7 Fire/Safety Rated Glass

2.2.7.1 Fire Protection Rated Glass

Clear tempered and meet 16 CFR 1201 Category I (under 0.836 sqm) or II (over 0.836 sqm) impact safety standard. Glass to make 20 minute rating when tested in accordance with NFPA 257 and NFPA 252. Glass to be permanently labeled with appropriate markings.2.2.7.2 Fire Resistive Rated Glazing

Fire resistive glass must be laminated, with intumescent interlayer, Type I transparent flat type, Class 1-clear and meet 16 CFR 1201 Category I (under 0.836 sqm) or II (over 0.836 sqm). Glass must have a 60 minute rating when tested in accordance with JIS A 1304. Glass must be permanently labeled with appropriate markings.

2.3 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace and hermetically sealed, conforming to ISO 28278. Submit performance and compliance documentation for each type of insulating glass.

Insulated glass units must have a Solar Heat Gain Coefficient (SHGC) maximum of 0.2500 determined according to ISO 15099 and a U-factor maximum of 2.2712 W per square m by K in accordance with ISO 15099.See drawigns for energy performance requirements for glazed systems (glazing and frames).

Spacer must be black, roll-formed, polyurethane and silicon foams, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

See drawings for description of insulating unit construction.

2.3.1 Low Emissivity Coatings

Interior and exterior glass panes for Low-E insulating units must be annealed flat glass, Class 1-clear with anti-reflective low-emissivity coating or heat-strengthened or fully tempered glass complying with JIS R 3222, Condition C on No. 2 surface (inside surface of exterior pane) JIS R 3222, conforming to JIS R 3202. Glass performance must be U value maximum of 2.2712W/m2-K, Solar Heat Gain Coefficient (SHGC) maximum of 0.2500.

2.4 SETTING AND SEALING MATERIALS

Provide as specified in the MLIT-SS Ch 16, Sec 14, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a qualified testing agency.

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

2.4.1 Sealants

Provide elastomeric sealants.

2.4.1.1 Elastomeric Sealant

JIS A 5758. Use for channel or stop glazing metal sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units . Color of sealant must be white.

2.4.1.2 Structural Sealant

JIS A 5758.

2.4.2 Joint Backer

Joint backer must have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.4.3 Glazing Tapes

2.4.3.1 Back-Bedding Mastic Glazing Tapes

Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with JIS A 5758.

2.4.3.2 Expanded Cellular Glazing Tapes

Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with JIS A 5758 as recommended by tape and glass manufacturers.

2.4.4 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with JIS K 7366. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes must be chemically compatible with the product being set.

2.4.5 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to JIS A 5756 and JIS K 6262. Edge blocking as recommended by glazing manufacturer. Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer. Block color must be black.

2.4.6 Glazing Gaskets

Glazing gaskets must be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal

movements. Glazing gaskets for a single glazed opening must be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets must be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Provide glazing gasket profiles as recommended by the manufacturer for the intended application.

#### 2.4.6.1 Fixed Glazing Gaskets

Fixed glazing gaskets must be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to JIS A 5756.

#### 2.4.6.2 Wedge Glazing Gaskets

Wedge glazing gaskets must be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to JIS A 5756.

#### 2.4.6.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing must be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

### 2.4.7 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use JIS A 1439 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

## PART 3 EXECUTION

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

### 3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in MLIT-SS Ch 16, Sec 14 and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

### 3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in MLIT-SS Ch 16, Sec 14 and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with

manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

### 3.2.1 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of MLIT-SS Ch 16, Sec 14.

### 3.2.2 Installation of Laminated Glass

Sashes which are to receive laminated glass must be weeped to the outside to allow water drainage into the channel.

## 3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.

## 3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

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SECTION 08 91 00

METAL WALL LOUVERS

**08/20**

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# SECTION 08 91 00

# METAL WALL LOUVERS
**08/20**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

| | |
|---|---|
| AMCA 500-L | (2015) Laboratory Methods of Testing Louvers for Rating |
| AMCA 511 | (2010; R 2016) Certified Ratings Program for Air Control Devices |

ALUMINUM ASSOCIATION (AA)

| | |
|---|---|
| AA DAF45 | (2003; Reaffirmed 2009) Designation System for Aluminum Finishes |

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

| | |
|---|---|
| AAMA 611 | (2014) Voluntary Specification for Anodized Architectural Aluminum |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM B209M | (2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) |
| ASTM B221M | (2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS H 4000 | (2017) Aluminium and Aluminium Alloy Sheets, Strips and Plates (Amendment 1) |
| JIS H 4100 | (2015) Aluminium and Aluminium Alloy Extruded Profiles |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall Louvers

SD-03 Product Data

Metal Wall Louvers

SD-04 Samples

Wall Louver Samples; G

Door Louver Samples; G

## 1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers must be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

## 1.4 DETAIL DRAWINGS

Show all information necessary for fabrication and installation of wall louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

## 1.5 COLOR SAMPLES

Colors of finishes for wall louver samples and door louver samples must closely approximate colors indicated. Where color is not indicated, submit the manufacturer's standard colors to the Contracting Officer for selection.

# PART 2 PRODUCTS

## 2.1 MATERIALS

### 2.1.1 Aluminum Sheet

ASTM B209M or JIS H 4000, alloy 3003 or 5005 with temper as required for forming.

### 2.1.2 Extruded Aluminum

ASTM B221M or JIS H 4100, alloy 6063-T5 or -T52.

### 2.1.3 Stainless Steel

Type 302 or 304, with 2B finish.

## 2.2 METAL WALL LOUVERS

Wind driven rain resistant type, with bird screens and made to withstand a wind load of not less than 1.44 kilopascals. Wall louvers must bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-L and AMCA 511. The rating must show a water penetration of 0.06 kilograms or less per square meter of free area at a free velocity of 244 meters per minute.

2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 2 mm.

2.2.2 Formed Metal Louvers

Formed of stainless steel sheet not thinner than 16 U.S. gage, or aluminum sheet not less than 2 mm thick.

2.2.3 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions for all louvers more than 1500 mm in width at not more than 1500 mm on centers. Provide mullion covers on both faces of joints between louvers.

2.2.4 Screens and Frames

For aluminum louvers, provide 12.5 mm square mesh, 1.8 or 1.5 mm aluminum or 6 mm square mesh, 1.5 mm aluminum bird screening. For steel louvers, provide 12.5 mm square mesh, 2.5 or 1.5 mm zinc-coated steel; 12.5 mm square mesh, 1.5 mm copper; or 6 mm square mesh, 1.5 mm thick zinc-coated steel or copper bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

2.4 FINISHES

2.4.1 Aluminum

Exposed aluminum surfaces must be factory finished with an anodic coating . Color must be as indicated. Louvers must have the same finish.

2.4.1.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF45 and AAMA 611. Finish must be:

b. Architectural Class I ( 0.0175 mm or thicker), designation AA-M10-C22-anodized color as indicated in the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Louvers

Install using stops or moldings, flanges, strap anchors, or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

3.1.2 Screens and Frames

Attach frames to louvers with screws or bolts.

## 3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

### 3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

### 3.2.2 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

### 3.2.3 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

### 3.2.4 Wood

Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

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DIVISION 09 - FINISHES

SECTION 09 29 00

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**08/16**

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# SECTION 09 29 00

# GYPSUM BOARD
**08/16**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

GYPSUM BOARD ASSOCIATION OF JAPAN (GRAJ)

| | |
|---|---|
| GRAM | Gypsum Board Application Manual |

JAPAN ADHESIVE INDUSTRY ASSOCIATION (JAIA)

| | |
|---|---|
| JAIA 4VOC | Voluntary VOC Regulating Rule for Indoor Air Pollution Control |

JAPANESE STANDARDS ASSOCIATION (JSA)

| | |
|---|---|
| JIS A 1901 | (2015) Determination of the Emission of Volatile Organic Compounds and Aldehydes by Building Products - Small Chamber Test Method |
| JIS A 5430 | (2018) Fiber Reinforced Cement Boards |
| JIS A 5508 | (2019) Nails |
| JIS A 6901 | (2019) Gypsum Boards |
| JIS A 6914 | (2017) Jointing Materials for Gypsum Plasterboards |
| JIS B 1125 | (2020) Self Drilling Tapping Screws |
| JIS Z 2911 | (2018) Methods of Test for Fungus Resistance |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL Fire Resistance | (2014) Fire Resistance Directory |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-08 Manufacturer's Instructions

Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer Maintenance Instructions

## 1.3 DELIVERY, STORAGE, AND HANDLING

### 1.3.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

### 1.3.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Do not store gypsum wallboard with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants, . Do not store panels near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have visible moisture or biological growth.

### 1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

## 1.4 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

## 1.5 SCHEDULING

The gypsum wallboard must be taped, finished and primed before the installation of the highly emitting materials.

Commence application only after the area scheduled for gypsum board work is completely weathertight. The heating, ventilating, and air-conditioning systems must be complete and in operation prior to application of the gypsum board. If the mechanical system cannot be activated before gypsum board is begun, the gypsum board work may proceed in accordance with an approved plan to maintain the environmental conditions specified below. Apply gypsum board prior to the installation of finish flooring and acoustic ceiling.

## 1.6 ENVIRONMENTAL REQUIREMENTS

Do not expose the gypsum board to excessive sunlight prior to gypsum board application. Maintain a continuous uniform temperature of not less than

10 degrees C and not more than 27 degrees C for at least one week prior to the application of gypsum board work, while the gypsum board application is being done, and for at least one week after the gypsum board is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during gypsum board application, set, and until gypsum board jointing is dry. In glazed areas, keep windows open top and bottom or side to side 75 to 100 mm. Reduce openings in cold weather to prevent freezing of joint compound when applied. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 10 degrees C or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following gypsum boarding and until gypsum board jointing complete and is dry.

## 1.7 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated.

# PART 2 PRODUCTS

## 2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only. Submit Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

### 2.1.1 Gypsum Board

Gypsum board shall conform to JIS A 6901. Their types and thicknesses shall conform to the drawings. Discharge of formaldehyde of boards shall be F four stars rated materials unless otherwise specified in the Special Specifications. Materials for ceilings and walls shall be specified or certified as fire retardant materials by the Building Standards Law. Provide all boards and joint treating materials manufactured from asbestos free materials only.

#### 2.1.1.1 Regular

900 mm wide, 12.5 mm thick, tapered edges.

#### 2.1.1.2 Waterproof gypsum board

Sheating waterproof gypsum board (GB-S)conform to JIS A 6901. 910mm wide, 12.5mm thick, tapered edge.

#### 2.1.1.3 Type X or Type Z (Special Fire-Resistant)

900 mm wide, 15 mm thick, tapered edges.

#### 2.1.1.4 Mold Resistant / Anti-Microbial Gypsum

JIS Z 2911. 900 mm wide, 15 mm thick, square, tapered or beveled edges.

2.1.2 Gypsum Backing Board

JIS A 6901, gypsum backing board must be used as a base in a multilayer system.

2.1.2.1 Regular

900 mm wide, 12.5 15 mm thick, square, tapered or beveled edges.

2.1.2.2 Type Z (Special Fire-Resistant)

1200 mm wide, 15, 25 mm thick, square or tapered edges.

2.1.3 Regular Water-Resistant Gypsum Backing Board

2.1.3.1 Regular

900 mm wide, 12.5 mm thick, tapered or beveled edges.

2.1.3.2 Type X or Type Z (Special Fire-Resistant)

900 mm wide, 15 mm thick, tapered or beveled edges.

2.1.4 Glass Mat Water-Resistant Gypsum Tile Backing Board

Water absorption rate of less than 5 percent.

2.1.4.1 Regular

1200 mm wide, 12.5 mm thick, square, tapered or beveled edges.

2.1.4.2 Type Z (Special Fire-Resistant)

900 mm wide, 15 mm thick, square, tapered or beveled edges.

2.1.5 Cementitious Backer Units

In accordance with JIS A 5430.

2.1.6 Joint Treatment Materials

JIS A 6914. Product must be low emitting VOC types with VOC limits not exceeding 50 g/L. Provide data identifying VOC content of joint compound. Use all-purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds must be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.6.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.6.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.6.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.6.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.6.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.7 Fasteners

2.1.7.1 Nails

JIS A 5508.

2.1.7.2 Screws

JIS B 1125 steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.84 mm thick. JIS B 1125 steel drill screws for fastening gypsum board to steel framing members 0.84 to 2.84 mm thick. Provide cementitious backer unit screws with a polymer coating.

2.1.7.3 Staples

1.5 mm thick flattened galvanized wire staples with 11.1 mm wide crown outside measurement and divergent point for base ply of two-ply gypsum board application. Use as follows:

| Length of Legs | Thickness of Gypsum Board |
|---|---|
| 28.6 mm | 12.5 mm |
| 31.8 mm | 15 mm |

2.1.8 Adhesives

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of UL 2818(Greenguard) Gold, SCS Global SErvices Indoor ADvantage Gold, or F 4-Star and JAIA 4VOC . Provide aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of JIS A 1901 (limit requirements for either office or classroom spaces regardless of space type. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

#### 2.1.8.1 Adhesive for Laminating

Not permitted.

### 2.1.9 Gypsum Studs

Provide 25 mm minimum thickness and 150 mm minimum width. Studs may be of 25 mm thick gypsum board or multilayers fastened to required thickness. Conform to JIS A 6901 for material and Gypsum Board Application Manual (GRAM) for installation.

### 2.1.10 Shaftwall Liner Panel

Conform to the UL Fire Resistance or MLIT for the Design Numbers(s) indicated for shaftwall liner panels. Manufacture liner panel for cavity shaftwall system, with water-resistant paper faces, bevel edges, single lengths to fit required conditions, as indicated.

### 2.1.11 Accessories

Fabricate from corrosion protected steel designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges must be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

### 2.1.12 Water

Provide clean, fresh, and potable water.

## PART 3 EXECUTION

## 3.1 EXAMINATION

### 3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

### 3.1.2 Gypsum Board and Framing

Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

### 3.1.3 Masonry and Concrete Walls

Verify that surfaces of masonry and concrete walls to receive gypsum board applied with adhesive are dry, free of dust, oil, form release agents, protrusions and voids, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

### 3.1.4 Building Construction Materials

Do not install building construction materials that show visual evidence of biological growth.

## 3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturers instructions and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Minimize framing by floating corners with single studs and drywall clips. Install 16 mm gypsum or 13 mm ceiling board over framing at 610 mm on center. Provide type of gypsum board for use in each system specified herein as indicated.

### 3.2.1 Adhesive Application to Interior Masonry or Concrete Walls

Apply in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions.

### 3.2.2 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions.

### 3.2.3 Arches and Bending Radii

Apply in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions.

### 3.2.4 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board or water-resistant gypsum backing board in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions.

### 3.2.5 Exterior Application

Apply exterior gypsum board (such as at soffits) in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions.

### 3.2.6 Floating Interior Angles

Minimize framing by floating corners with single studs and drywall clips. Locate the attachment fasteners adjacent to ceiling and wall intersections

in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions, for single-ply and two-ply applications of gypsum board to wood framing.

### 3.2.7 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

### 3.2.8 Application of Abuse Resistant Gypsum Board

Apply in accordance with applicable system of Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions. Follow manufacturers written instructions on how to cut, drill and attach board.

## 3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

### 3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units. Place a 7.6 kg asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 150 mm overlap of sheets laid shingle style.

### 3.3.2 Joint Treatment

Gypsum Board Application Manual (GRAM), Gypsum Board Association of Japan or Manufacturer's Instructions.

## 3.4 FINISHING OF GYPSUM BOARD

Finish plenum areas above ceilings to Level 1. Finish water resistant gypsum backing board to receive ceramic tile to Level 2. Finish walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting to Level 3. Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4. Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5. Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use self-adhering fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

### 3.4.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to Level 5. Apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

### 3.4.2 Gypsum Board Finish Levels

#### 3.4.2.1 Level 1

All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

#### 3.4.2.2 Level 2

All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.

#### 3.4.2.3 Level 3

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. One additional coat of joint compound shall be applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of final finishes.

#### 3.4.2.4 Level 4

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied overall flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of final finishes.

#### 3.4.2.5 Level 5

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.

Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of finish paint.

## 3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

### 3.5.1 Sealing for Glass Mat or Reinforced Gypsum Board Sheathing

Apply silicone sealant in a 9.5 mm bead to all joints and trowel flat. Apply enough of the same sealant to all fasteners penetrating through the glass mat gypsum board surface to completely cover the penetration when troweled flat. Do not place construction and materials behind sheathing until a visual inspection of sealed joints during daylight hours has been completed by Contracting Officer.

## 3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated or . Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

## 3.7 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

## 3.8 SHAFTWALL FRAMING

Install the shaftwall system in accordance with the system manufacturer's published instructions. Coordinate bucks, anchors, blocking and other items placed in or behind shaftwall framing with electrical and mechanical work. Patch or replace fireproofing materials which are damaged or removed during shaftwall construction.

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# SECTION 09 65 00

# RESILIENT FLOORING
**08/10**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E648 | (2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5536 | (2015) Adhesives for Resilient Textile or Laminate Floor Coverings |
| JIS A 5705 | (2010) Polyvinyl Chloride Floorcoverings |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 19 | (2019) Public Building Construction Standard Specifications Chapter 19: Interior Finishing Works |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Resilient Flooring and Accessories; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G

### 1.3 JAPAN PUBLIC BUILDING CONSTRUCTION STANDARDS

Follow MLIT SS Chapter 19 for interior finishing works.

## 1.4 INDOOR AIR QUALITY

### 1.4.1 Floor Covering Materials

Provide Luxury Vinyl Tile, and wall base products certified to meet indoor air quality requirements of third-party programs.

#### 1.4.1.1 Adhesives, Caulking and Sealants

Provide products certified to meet emission requirement of F 4-Star and JAIA 4VOC.

## 1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature maintained above 20 degrees C and below 30 degrees C, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber surface products with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions, including . Do not store exposed rubber surface materials in occupied spaces. Do not store near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

## 1.6 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 20 degrees C and below 30 degrees C for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 13 degrees C thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

## 1.7 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

## 1.8 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

# PART 2 PRODUCTS

## 2.1 LUXURY VINYL TILE

Conform to JIS A 5705 printed film with a minimum wear layer thickness 0.55 mm (22 mil) and minimum overall thickness 4.5 mm. Provide 25 cm by 1m tile. Provide tile with a factory protective finish that enhances cleanability and durability.

## 2.2 WALL BASE

Provide 100 mm high and a minimum 3.175 mm thick wall base. Provide job formed corners in matching height, shape, and color.

## 2.3 STAIR TREADS, RISERS AND STRINGERS

Provide either a one piece nosing/tread/riser or a two piece nosing/tread design with a matching coved riser.

## 2.4 MOULDING

Provide tapered mouldings of vinyl, rubber or clear anodized aluminum and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 6 mm. Provide bevel change in level between 6 and 13 mm with a slope no greater than 1:2.

## 2.5 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer or per JIS A 5536 and comply with local indoor air quality standards. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

## 2.6 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Use one of the following substrates:

f. Concrete.

## 2.7 POLISH/FINISH

Provide polish finish as recommended by the manufacturer.

## 2.8 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

## 2.9 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories as indicated in the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit scaled drawings indicating patterns (including location of patterns and colors) and dimensions. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, mouldings, and accessories sized a minimum 60 by 100 mm. Submit Data Package 1 in

accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## 2.10 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

# PART 3 EXECUTION

## 3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

## 3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 4.75 in 3048 mm. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

## 3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

## 3.4 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth. Installation shall comply with MLIT SS Chapter 19.

## 3.5 PLACING LUXURY VINYL TILES

Install luxury vinyl tile flooring using glue down installation. Install flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions for installation method specified. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

## 3.6 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions. Anchor aluminum moulding to floor surfaces as recommended by the manufacturer.

## 3.7 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

## 3.8 PLACING STAIR TREADS, RISERS, AND STRINGERS

Secure and install stair treads, risers, and stringers in accordance with manufacturer's printed installation instructions. Cover the surface of treads and risers the full width of the stairs. Provide equal length pieces butted together to cover the treads and risers for stairs wider than manufacturer's standard lengths. Provide stringer angles on both the wall and banister sides of the stairs, and landing trim.

## 3.9 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry and clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and finish in accordance with manufacturer's written instructions.

## 3.10 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace

flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

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# PAINTS AND COATINGS

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT SS Chapter 18 | (2019) Public Building Construction Standard Specification: Chapter 18 Painting Work |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (2024) Safety and Health Requirements Manual |

### 1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITALS PROCEDURES.

SD-03 Product Data

Coatings

Product Data Sheets

SD-04 Samples

Color

SD-07 Certificates

Contractor Chemical/Hazardous Material Request Authorization Form

SD-08 Manufacturer's Instructions

Application Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings

## 1.3 CERTIFICATES

### 1.3.1 Indoor Air Quality

Submit required indoor air quality certifications in one submittal package.

#### 1.3.1.1 Paints and Coatings

Provide paint and coating products certified to meet formaldehyde emission class F****.

### 1.3.2 Contractor Chemical/Hazardous Material Request Authorization Form

Per Camp Courtney Hazardous Materials Management Plan, no chemicals or hazardous materials will be brought onto / used on Camp Courtney until an approved Contractor Chemical/Hazardous Material Request Authorization Form has been completed. Details shall be provided by CEIE.

## 1.4 APPLICATOR'S QUALIFICATIONS

### 1.4.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

a. Name of individual and proposed position for this work.

b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

## 1.5 QUALITY ASSURANCE

### 1.5.1 Field Samples and Tests

The Contracting Officer's representatives (COR) may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURES. Test each chosen product as specified in

the paragraph TESTING PROCEDURE. Remove products from the job site which do not conform, and replace with new products that conform to the referenced specification. Test replacement products that failed initial testing at no cost to the Government.

#### 1.5.1.1 Sampling Procedure

The Contracting Officer's representatives (COR) will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor will provide one liter samples of the selected paint materials. Take samples in the presence of the Contracting Officer's representatives (COR), and label, and identify each sample. Provide labels in accordance with the paragraph PACKAGING, LABELING, AND STORAGE of this specification.

#### 1.5.1.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph "Qualification Testing" laboratory for coatings. Include the backup data and summary of the test results within the qualification testing lab report. Provide a summary listing of all the reference specification requirements and the result of each test. Clearly indicate in the summary whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If MPI is chosen to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

## 1.6 PACKAGING, LABELING, AND STORAGE

Provide paints in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Furnish pigmented paints in containers not larger than 20 liters. Store paints and thinners in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 4 to 35 degrees C. Do not store paint, polyurethane, varnish, or wood stain products with materials that have a high capacity to absorb VOC emissions. Do not store paint, polyurethane, varnish, or wood stain products in occupied spaces.

## 1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 26 GOVERNMENT SAFETY REQUIREMENTS and in Appendix A of EM 385-1-1. Include in the Activity Hazard Analysis the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

### 1.7.1 Safety Methods Used During Coating ApplicationWorker Exposures

Comply with the requirements of MLIT SS Chapter 18.Exposure of workers to hazardous chemical substances shall not exceed limits specified in SDS, or as required by a more stringent applicable regulation.

### 1.7.2 Toxic Compounds

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of: Toxic prodcts having ineffective physiological warning properties, such as no or low odor or irritation levels, shall not be used unless approved by the Contracting Officer.

a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.

Submit manufacturer's Safety Data Sheets for coatings, solvents, and other potentially hazardous materials.

### 1.7.3 Training

Workers having access to an affected work area shall be informed of the contents of the applicable safety data sheets (SDS) and shall be informed of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive mists and odors from the painting operations. Workers involved in preparation, painting and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

### 1.7.4 Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from preparation, painting and clean-up operations.

## 1.8 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

### 1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

a. Less than 3 degrees C above dew point.

b. Below 10 degrees C or over 35 degrees C, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

## 1.9 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs.

## 1.10 COLOR SELECTION

Provide colors of finish coats as indicated or specified. Allow Contracting Officer to select colors not indicated or specified. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Provide color, texture, and pattern of wall coating systems as indicated.

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated. Submit color stencil codes.

# PART 2 PRODUCTS

## 2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit product data sheets for specified coatings and solvents. Provide preprinted cleaning and maintenance instructions for all coating systems. Submit Manufacturer's Instructions on Mixing: Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

## 2.2 PAINT

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall be radical control type, and conform to the requirements listed in the painting schedules at the end of this section, except when the required amount of a material of a particular batch is 200 liters (50 gallons) or less, an approved first-line proprietary paint material with similar intended formulation, usage and color to that specified may be used. Recovered materials shall be included in the U.S. made latex paint at the content levels listed under the EPA's designated products available via the Internet at https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program#products. Additional requirements are as follows:

2.2.1 Colors and Tints

Colors shall be as selected from JAPAN PAINT MANUFACTURES ASSOCIATION (JPMA), as indicated. Tinting of epoxy and urethane paints shall be done by the manufacturer. The color of the undercoats shall vary slightly from the color of the next coat.

2.2.2 Mildewcide and Insecticide

Paint specified for all coats applied to fabrics and vapor barrier jackets over insulation and surfaces in the area shall contain a mildewcide that will not adversely affect the color, texture, or durability of the coating. The mildewcide shall be incorporated into the paint by the manufacturer. Mercurial mildewcide shall not be used in interior paint. Insecticides shall not be used in paint.

2.2.3 Lead Content

Do not use coatings having a lead content over 0.009 percent by weight of nonvolatile content.

2.2.4 Chromate Content

Do not use coatings containing zinc chromate or strontium chromate.

2.2.5 Asbestos Content

Provide asbestos-free materials.

2.2.6 Mercury Content

Provide materials free of mercury or mercury compounds.

2.2.7 Silica

Provide abrasive blast media containing no free crystalline silica.

2.2.8 Volatile Organic Compound (VOC) Content

Paints shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards and shall conform to the restrictions of the local air pollution control authority.

2.2.9 Repair coat of Built-up Roof

Use the standard/compatible paint for built-up roof where the cut, patch will be done to match adjacent condition.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

## 3.2 SURFACE PREPARATION

Surface preparations methods are specified in JASS 18 and JAPAN ARCHITECTURAL REPAIR WORK STANDARD SPECIFICATION (Koukyou Kentiku Kaishuu Kouji Hyoujyun Shiyousho). Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

### 3.2.1 Ferrous Surfaces

Ferrous surfaces including those that have been shop-coated shall be solvent-cleaned or detergent-washed in accordance with JASS No.18. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools. Shop- coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection. Step/gap found on surface shall be sanded to have smooth surface to paint in accordance with JAPAN ARCHITECTURAL REPAIR WORK STANDARD SPECIFICATION (Koukyou Kentiku Kaishuu Kouji Hyoujyun Shiyousho).

### 3.2.2 Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent-cleaned or detergent-washed in accordance with JASS No.18

### 3.2.3 Gypsum Board Surfaces

Gypsum board surfaces shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush, rubbing with a cloth, or vacuum cleaning prior to application of the first-coat material. A damp cloth or sponge may be used if paint will be water-based.

### 3.2.4 Mastic-Type Surfaces

Mastic-type surfaces shall be prepared by removing foreign material in accordance with JASS No.18.

### 3.2.5 Plaster Surfaces

Plaster shall be clean and free from loose matter and shall have an instrument-measured moisture content not exceeding 8 percent.

### 3.2.6 Previously Painted Surfaces

Previously painted surfaces specified to be repainted shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas. Edges of chipped paint shall be feather edged and sanded smooth. Rusty metal surfaces shall be cleaned as per JASS No.18 and JAPAN ARCHITECTURAL REPAIR WORK STANDARD

SPECIFICATION (Koukyou Kentiku Kaishuu Kouji Hyoujyun Shiyousho). Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

## 3.3 MIXING AND THINNING

When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 0.125 L (1 pint) of suitable thinner per liter (Gallon). The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

### 3.3.1 Cement-Emulsion Filler Coat

Cement and aggregate shall be dry-mixed so that uniform distribution and intermixing are obtained. Mixing liquid and one-half of the total amounts of water shall be premixed and added gradually to the white Portland cement and aggregate with constant stirring until a thick, smooth material is obtained. Emulsion paint shall then be added to the mixture and stirred until uniformity is obtained. The blend shall have a thick, creamy consistency. The remainder of the water shall be added if necessary to obtain a material with adequate application properties. Blending resin emulsion or emulsion paint with any other component shall be done with caution; too rapid an agitation will cause air entrapment and foaming.

### 3.3.2 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

## 3.4 APPLICATION

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless otherwise specified or recommended by the paint manufacturer, brush, roller, or spray may apply paint. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

### 3.4.1 Ventilation

Affected areas shall be ventilated during paint application so that

workers exposure to chemical substances shall not exceed limits as established by MSDS or as required by a more stringent applicable regulation. Interior work zones having a volume of 280 cubic meters (10,000 cubic feet) or less shall be ventilated at a minimum of 2 air exchanges per hour. Ventilation in larger work zones shall be maintained by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Return air inlets in the work zone shall be temporarily sealed before start of work until the coatings have dried.

### 3.4.2 Respirators

Operators and personnel in the vicinity of operating paint sprayers shall wear respirators.

### 3.4.3 First Coat

The first coat on plaster, gypsum wallboard, and other surfaces shall include repeated touching up of suction spots or overall application of primer or sealer to produce uniform color and gloss. Excess sealer shall be wiped off after each application. The first coat on both faces of wood doors shall be applied at essentially the same time. Glazed doors and sashes shall be given the specified coating system within 3 weeks of the time they are glazed, but not before the glazing material has set; paint shall overlay glass about 1.78 mm (70 mils) all around. Each varnish coat shall be sanded lightly prior to application of subsequent coats.

### 3.4.4 Timing

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion. Manufacturer's instructions for application, curing and drying time between coats of two-component systems shall be followed.

### 3.4.5 Stains

JIS K5500 or approved equal.

### 3.4.6 Fillers

Concrete and masonry surface voids shall be filled; however, surface irregularities need not be completely filled. The dried filler shall be uniform and free of pinholes. Filler shall not be applied over caulking compound.

#### 3.4.6.1 Cement-Emulsion Filler

Immediately before filler application, surfaces shall be dampened uniformly and thoroughly, with no free surface water visible, by several applications of potable water with a fog spray, allowing time between the sprayings for water to be absorbed. Cement-emulsion filler shall be

scrubbed into the surface vigorously with a stiff-bristled brush having tampico or palmyra bristles not longer than 63 mm. At least 24 hours shall elapse before applying exterior emulsion paint over cement-emulsion filler. When the ambient temperature is over 29 degrees C, (85 degrees F,) cement-emulsion filler surfaces shall be dampened lightly with a fog spray of potable water immediately prior to application of the subsequent paint coat.

#### 3.4.6.2 Latex Filler

Latex filler shall be applied according to the manufacturer's instructions. Surface voids shall be filled and excess filler shall be removed from the surface with a rubber squeegee. The filler shall be allowed to dry the length of time specified by the manufacturer prior to applying successive coats of paint.

### 3.4.7 Textured Coating

Application of textured coating shall be as specified in the manufacturer's printed directions.

### 3.4.8 Ferrous-Metal Primer

Primer for ferrous-metal shall be applied to ferrous surfaces to receive paint other than asphalt varnish prior to deterioration of the prepared surface. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

## 3.5 PIPE COLOR CODE MARKING

Not used. Repaint as existing colors.

## 3.6 BUILDING NUMBER

Redraw the building number using the same font and same size. New location and direction shall be directed by COR.

## 3.7 SURFACES TO BE PAINTED

Surfaces listed in the painting schedules at the end of this section, other than those listed in paragraph 3.8 SURFACES NOT TO BE PAINTED, shall be painted as scheduled.

## 3.8 SURFACES NOT TO BE PAINTED

Surfaces in the following areas shall not to be painted:

Stainless Steel
Aluminum

In addition, surfaces of hardware, fittings, and other factory finished items shall not be painted.

## 3.9 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers

shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

## 3.10 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats of paint to be applied. Paint with vapor retarder classification of US Class III or JP Class A for the paint on the interior of exterior walls. Paint with Vapor Retarder Classification of US Class I or JP Class C for the pain on the exterior of exterior walls.

**PAINTING SCHEDULE**

JASS 18

General Paint

| SURFACE | USE/PURPOSE | JASS | GLOSS & 1ST, 2ND COATS | JIS | PREPARATION | FINISHCOAT |
|---|---|---|---|---|---|---|
| Steel, Zinc | Siding, Flashing, Door & Frame | N/A | Gloss 70% & Color Green 35-30B | N/A | Conform to JASS 18 or Manufacturer's Standards | SK Premium NAD Silicone (SK Kaken) |
| Conc, CMU, Stucco, Mortar, etc | General Ext | N/A | Semi-Gloss | N/A | Conform to JASS 18 or Manufacturer's Standards | SK Premium Silicon (SK Kaken) |

Finish Coating

| SURFACE | USE/PURPOSE | JASS | GLOSS & 1ST, 2ND COATS | JIS | PREPARATION | FINISHCOAT |
|---|---|---|---|---|---|---|
| Ext Conc (New) | Multi-layer Acrylic Resin | N/A | Semi-Gloss | N/A | Conform to JASS 18 or Manufacturer's Standards | SK Premium Silicone (SK Kaken) |
| | **Texture Coat** | | | | | |
| Ext Metal Surface | Re-coat | N/A | Gloss 70% & To match existing or Color Green 35-30B | N/A | Conform to JASS 18 or Manufacturer's Standards | SK Premium NAD Silicone (SK Kaken) |
| Ext Built-up Roof | Re-coat | N/A | Gloss 30% & Approximate Color Green 35-30B | N/A | Conform to JASS 18 or Manufacturer's Standards | SK Premium Silicon (SK Kaken) |

## 3.11 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance per MLIT SS Chapter 18 for each substrate before application of paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning so that dust and other contaminants will not fall on wet, newly painted surfaces. Spot-prime exposed ferrous metals such as

nail heads on or in contact with surfaces to be painted with water-thinned paints, with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

### 3.11.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials.

b. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits or per paint manufacturer's requirements. Allow surface to dry. Wipe immediately preceding the application of the first coat of any coating, unless specified otherwise.

c. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.

d. The requirements specified are minimum. Comply also with the application instructions of MLIT SS Chapter 18 and the paint manufacturer.

e. Thoroughly clean previously painted surfaces specified to be repainted and damaged during construction of all grease, dirt, dust or other foreign matter.

f. Remove blistering, cracking, flaking and peeling or otherwise deteriorated coatings.

g. Roughen slick surfaces. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas.

h. Feather and sand smooth edges of chipped paint.

i. Clean rusty metal surfaces per MLIT SS Chapter 18 and per paint manufacturer's instructions. Use solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting.

j. Provide new, proposed coatings that are compatible with existing coatings.

### 3.11.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding.

### 3.11.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

a. Surfaces containing large areas of minor defects;

b. Surfaces containing more than 20 percent peeling area; and

c. Surfaces designated by the Contracting Officer, such as surfaces where rust shows through existing coatings.

3.11.4 Substrate Repair

a. Repair substrate surface damaged during coating removal;

b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and

c. Clean and prime the substrate as specified.

3.12 APPLICATION

3.12.1 Coating Application

Application of paint per MLIT SS Chapter 18. At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Only apply paints, except water-thinned types to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.

Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.

a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.

b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate

coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.

c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

3.12.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. Verify that the written permission includes quantities and types of thinners to use.

The use of thinner does not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning cannot cause the paint to exceed limits on volatile organic compounds. Do not mix paints of different manufacturers.

3.12.3 Two-Component Systems

Mix two-component systems in accordance with manufacturer's instructions. Follow recommendation by the manufacturer for any thinning of the first coat to ensure proper penetration and sealing for each type of substrate.

3.12.4 Coating Systems

a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in MLIT SS Chapter 18.

b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness as specified in MLIT SS Chapter 18. Coating thickness where specified, refers to the minimum dry film thickness.

c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.

d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:

(1) One coat of primer.

(2) One coat of undercoat or intermediate coat.

(3) One topcoat to match adjacent surfaces.

e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

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DIVISION 10 - SPECIALTIES

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TRAFFIC SIGNAGE

**02/15, CHG 1: 05/17**

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TRAFFIC SIGNAGE
**02/15, CHG 1: 05/17**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

| | |
|---|---|
| MUTCD | (2009; Rev 2012) Manual on Uniform Traffic Control Devices |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5308 | (2019) Ready-Mixed Concrete |
| JIS G 3452 | (2016) Carbon Steel Pipes for Ordinary Piping (Amendment 1) |
| JIS H 4000 | (2017) Aluminium and Aluminium Alloy Sheets, Strips and Plates (Amendment 1) |
| JIS H 8641 | (2007) Hot Dip Galvanized Coatings |
| JIS Z 9117 | (2011) Retroreflective Materials |

1.2 GENERAL

All signs must be in accordance with the MUTCD.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Traffic Sign Posts

Traffic Sign Retroreflective Sheeting

# PART 2 PRODUCTS

## 2.1 TRAFFIC SIGN POSTS

### 2.1.1 Steel Tube

Conform to JIS G 3452 and hot-dip galvanized in accordance with JIS H 8641.

## 2.2 FLAT ALUMINUM SIGN PANELS

Aluminum sign panels must conform to JIS H 4000. The blanks must be free from laminations, blisters, open seams, pits, holes, other defects that may affect their appearance or use. The thickness must be uniform and the blank commercially flat.

## 2.3 TRAFFIC SIGN RETROREFLECTIVE SHEETING

All background sheeting applied to flat sheet and extruded panel signs must be in accordance with JIS Z 9117. Retroreflective sheeting must be high intensity that is an unmetallized micro prismatic reflective material.

Retroreflective sheeting must have sufficient adhesion, strength and flexibility such that the sheeting can be handled, processed and applied according to the manufacturer's recommendations without appreciable stretching, tearing, cracking or other damage.

## 2.4 LETTERS, NUMERALS, ARROWS, SYMBOLS, AND BORDERS

Apply letters, numerals, arrows, symbols, and borders on the retroreflective sheeting or opaque background of the sign using the direct or reverse screen process. Apply messages and borders of a color darker than the background to the paint or the retroreflective sheeting using the direct process. Messages and borders must be of a color lighter than the sign background and applied using the reverse screen process. Use opaque or transparent colors, inks, and paints of the type and quality recommended by the retroreflective sheeting manufacturer in the screen process. Perform the screening in a manner that results in a uniform color and tone, with sharply defined edges of legends and borders and without blemishes on the sign background that will affect intended use. Air dry or bake the signs after screening according to the manufacturer's recommendations to provide a smooth hard finish. Reject any signs with blister's or other blemishes.

## 2.5 HARDWARE

Bolts, nuts, post clips, lock and flat washers must be either aluminum alloy or commercial quality stainless steel, hot-dip galvanized or cadmium plated after fabrication. Provide fiber washers of commercial quality.

## 2.6 CONCRETE

JIS A 5308, using 19 mm maximum aggregate, and having minimum compressive strength of 21 MPa at 28 days.

# PART 3 EXECUTION

## 3.1 SIGN POSTS

### 3.1.1 Round Steel Tube

Sign posts consist of a base post and sign post. Embed steel sign base posts in concrete as indicated.

## 3.2 SIGN PANELS

Clean, degrease and etch the face of metal panels using methods recommended by the retroreflective sheeting manufacturer. After cleaning and degreasing, apply retroreflective sheeting material to the sign panels as recommended by the manufacturer. Perform shearing, cutting and punching prior to preparing the blanks for application of reflective material. Do not field drill holes in any part of the panel. Use nylon washers recommended by the sign sheeting manufacturer between the bolt heads and sign faces on flat sheet aluminum signs. Replace any damaged sign panels at no additional cost to the Government.

## 3.3 LOCATION AND POSITION OF SIGNS

Locate and erect all signs in accordance with the drawings and MUTCD. Vertically mount signs at right angles to the direction of, and facing, the traffic that they are intended to serve. Where mirror reflection from the sign face is encountered to such a degree as to reduce legibility, turn the sign slightly away from the road. Turn signs that are placed 9 m or more from the pavement edge toward the road. On curved alignments, determine the angle of placement by the direction of approaching traffic rather than by the roadway edge at the point where the sign is located. Mounted signs must present a smooth flat surface varying no more than 10 mm from a 1.2 m straightedge placed in any position on the face of the sign after erection. Mount signs on traffic signal posts with strap or clamp type sign supports. Each installed sign will be inspected by the Contracting Officer's representative prior to acceptance by the Government.

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SECTION 12 21 00

WINDOW BLINDS

**08/17**

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# SECTION 12 21 00

# WINDOW BLINDS
**08/17**

## PART 1 GENERAL

### 1.1 SUMMARY

Provide window treatment, complete with necessary brackets, fittings, and hardware. Provide each window treatment type as a complete unit in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Mount and operate equipment in accordance with manufacturer's instructions. Completely cover windows to receive a treatment.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1901 | (2015) Determination of the Emission of Volatile Organic Compounds and Aldehydes by Building Products - Small Chamber Test Method |

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES

SD-02 Shop Drawings

Installation

SD-10 Operation and Maintenance Data

Window Blinds; G

### 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated and free from dust, water, or other contaminants and has easy access for inspection and handling. Store materials flat in a clean dry area with temperature maintained above 1 0 degrees C. Do not open containers until needed for installation unless verification inspection is required.

## 1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

# PART 2 PRODUCTS

## 2.1 WINDOW BLINDS

Provide each blind, including hardware, accessory items, mounting brackets and fastenings, as a complete unit produced by one manufacturer. Unless otherwise indicated, all parts will be the same color and will match the color of the blind slat. Treat steel features for corrosion resistance. Submit product data and samples of each type and color of window treatment. Provide slat samples 150 mm in length for each color. Window blinds must meet emissions requirements of JIS A 1901 (use the office or classroom requirement, regardless of space type). Provide certification or validation of indoor air quality for window blinds.

### 2.1.1 Horizontal Blinds

Provide horizontal blinds with 25 mm slats. Blind units must be capable of nominally 180 degree partial tilting operation and full-height raising. Blinds must be outside mount. Provide tapes for 50 mm slats with longitudinal reinforced vinyl plastic in 1-piece turn ladder construction. Tapes for 25 mm slats must be braided polyester or nylon.

#### 2.1.1.1 Controls

A transparent tilting wand will be provided to tilt the slats, it will hang vertically by its own weight, and will swivel for easy operation. Provide a tilter control of enclosed construction. Provide moving parts and mechanical drive made of compatible materials which do not require lubrication during normal expected life. The tilter will tilt the slats to any desired angle and hold them at that angle so that any vibration or movement of ladders and slats will not drive the tilter and change the angle of slats. Include a mechanism to prevent over tightening. Provide a wand of sufficient length to reach to within 1500 mm of the floor. Provide cordless blinds.

#### 2.1.1.2 Intermediate Brackets

Provide intermediate brackets for installation, as recommended by the manufacturer, of blinds over 1500 mm wide.

#### 2.1.1.3 Bottom Rail

Provide bottom rail made of corrosion-resistant steel with factory applied finish. Provide closed oval shaped bottom rail with double-lock seam for maximum strength. Bottom rail and end caps to match slats in color.

#### 2.1.1.4 Braided Ladders

Provide braided ladders of 100 percent polyester yarn, color to match the slat color. Space ladders 15.2 slats per 300 mm of drop in order to provide a uniform overlap of the slats in a closed position.

2.1.2 Vertical Blinds

Provide vertical blind units capable of nominal 180 degree partial tilting operation and full stackback. Provide blinds that are listed by the manufacturer as designed for heavy duty strength applications including heavy duty hardware. Provide wall mounted vertical blinds with inside brackets. Provide blinds that are floor length. Outside mount type installation must provide adequate overlap to control light and privacy.

2.1.2.1 Louvers

Provide louvers which are fire resistant solid vinyl, UV stable, and impact resistant. Louvers that are 50 mm must overlap not less than mm and be dimensionally stable.

2.1.2.2 Carriers

Provide carriers to support each louver made of molded plastic to transverse on self-fabricated wheels for smooth, easy operation. The hook of the carrier must have an automatic latch to permit easy installation and removal of the louver, and to securely lock the louver for tilting and traversing.

2.1.2.3 Headrail System

Provide headrail system not less than 1.19 mm thick and made of anodized aluminum alloy or 0.635 mm thick phosphate treated steel with a baked on ivory gloss enamel paint finish. Provide a headrail that extends the full width of the blind and can be closed with an end cap at each end. One cap will contain the traversing and tilting controls. The opposite cap will house the pulley for the traversing cord.

2.1.2.4 Valance

Attach the manufacturer's standard valance to the headrail by metal or plastic holders which grip the top and bottom edge of the valance and accept an insert of the same material as the slats. Provide sufficient clearance behind the valance to permit the louvers to tilt without interference. Extend the headrail cover the full width of the blind..

2.1.2.5 Controls

Provide tilting and traversing controls that hang compactly at the side of the blinds and reach within 1500 mm of the floor. Provide tilt/traverse control that tilts all vanes simultaneously to any desired angle and hold them at that angle. Provide louvers that traverse two-way split. The traversing control cord will be minimum 1.78 mm 0.070 inch in diameter with a minimum breaking strength of 556 N 125 pounds. Anchor the cord to a lead carrier linked to all adjacent carriers. Provide louvers that traverse along the headrail by pulling one side of a fiberglass wand that tilts the louvers by turning the wand and traverses the louvers by using the wand as a control. Sliding glass doors will have a one way draw with stackback occurring opposite door openings.

2.1.2.6 Connectors and Spacers

The connector must be flexible, smooth and flat to slide unhindered when carriers move independently of each other, and to nest compactly when carriers are stacking. Relate the length of the links to the louver width

in order to equally space the traversing louvers, to maintain uniform and adequate overlap of louvers, and to fully cover the width of the opening.

2.1.2.7 Intermediate Brackets

Provide intermediate installation brackets for blinds over 1575 mm wide.

## 2.2 COLOR

Provide color, pattern and texture as indicated in the drawings and selected from manufacturer's standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers.

# PART 3 EXECUTION

## 3.1 EXAMINATION

After becoming familiar with details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

## 3.2 WINDOW TREATMENT PLACEMENT SCHEDULE

Provide window treatments at all windows in living units.

## 3.3 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Submit drawings showing fabrication and Installation details. Show layout and locations of track, direction of draw, mounting heights, and details. Provide Manufacturer's Instructions and Operation and Maintenance Data. Perform installation of window blinds in accordance with the approved detail drawings and manufacturer's installation instructions. Install units level, plumb, secure, and at proper height and location relative to window units. Provide and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Do not start installation until completion of room painting and finishing operations.

## 3.4 CLEAN-UP

Upon completion of the installation, inspect window treatments for soiling, damage or blemishes; and adjust them for form and appearance and proper operating condition. Repair or replace damaged units as directed by the Contracting Officer. Isolate metal parts from direct contact with concrete, mortar, or dissimilar metals. Ensure blinds installed in recessed pockets can be removable without disturbing the pocket. The entire blind, when retracted, must be contained behind the pocket. For blinds installed outside the jambs and mullions, overlap each jamb and mullion 20 mm or more when the jamb and mullion sizes permit. Include all hardware, brackets, anchors, fasteners, and accessories necessary for a complete, finished installation.

-- End of Section --

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13 48 73

SEISMIC AND ANTITERRORISM BRACING FOR MISCELLANEOUS EQUIPMENT

**05/22**

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# SECTION 13 48 73

# SEISMIC AND ANTITERRORISM BRACING FOR MISCELLANEOUS EQUIPMENT
**05/22**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE ARCHITECTURAL STANDARD SPECIFICATIONS (JASS)

| | |
|---|---|
| JASS 6 | (2007) Structural Steelwork Specification for Building Construction |

THE BUILDING CENTER OF JAPAN (BCJ)

| | |
|---|---|
| BSLJ | Building Standard Law of Japan, current edition |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS B 1048 | (2021) Fasteners - Hot dip galvanized coatings |
| JIS B 1186 | (2013) Sets of High Strength Hexagon Bolt, Hexagon Nut and Plain Washers for Friction Grip Joints |
| JIS G 3101 | (2020) Rolled Steels for General Structure |
| JIS G 3106 | (2020) Rolled Steels for Welded Structure |
| JIS G 3114 | (2022) Hot-Rolled Atmospheric Corrosion Resisting Steels for Welded Structure |
| JIS G 3136 | (2022) Rolled Steels for Building Structure |
| JIS G 3444 | (2021) Carbon Steel Tubes for General Structure |
| JIS G 3466 | (2021) Carbon Steel Square and Rectangular Tubes for General Structure |
| JIS G 3475 | (2021) Carbon Steel Tubes for Building Structure |
| JIS G 3549 | (2000) Wire Ropes for Structure |

### 1.2 SYSTEM DESCRIPTION

#### 1.2.1 General Requirements

Apply the requirements for seismic protection measures, described in this

section, of the miscellaneous equipment and systems listed below. Seismic bracing shall provide resistance against moderate earthquake ground motion (return period of several decades) with no significant damage to the equipment and its bracing in order to maintain continuous service, as outlined in the BSLJ.

### 1.2.2 Antiterrorism (AT) Requirements (UFC 4-010-01)

In a separate load scenario from seismic load cases, all discrete overhead equipment having its weight (W) more than 14 kg shall have its mounting designed to resist the force of 0.5×W along horizontal direction and 1.5×W in the downward direction. Overhead items weighing less than 14 kg, floor-mounted items, and wall-mounted items not overhead do not require AT bracing. Distributed systems such as suspended ceilings, piping and ducts do not require AT bracing, while seismic bracing is still applicable.

### 1.2.3 Miscellaneous Equipment and Systems

Provide bracing and attachment for the following miscellaneous equipment, or similar in nature, and components developed by the Contractor in accordance with the requirements of this specification:

Storage cabinets
Ornamentations
Storage Racks
Signs and Billboards
Shelving
Furnishings
Partitions
Stacks
Wall/ceiling mounted TVs and other audio/video equipment
Pole or frame supported equipment
Storage tanks for water and oil
Refrigerators and vending machines

### 1.2.4 Contractor Designed Bracing

Submit copies of the design calculations with the drawings. Calculations must be prepared, stamped and signed by a 1st class Kenchiku-shi or 2nd class Kenchiku-shi. Calculations must verify the capability of structural members to which bracing is attached for carrying the load from the brace. Resistance to lateral forces induced by earthquakes must be accomplished without consideration of friction resulting from gravity loads. Seismic loading shall determined in accordance with BSLJ and JASS 6 must be used for the design. Provide sufficient braces for equipment to resist a horizontal force as specified in the above paragraphs without exceeding safe working stress of bracing components. Provide, for approval, specific force calculations for the equipment bracing in the project.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Bracing; G

SD-03 Product Data

Bracing; G

Equipment Requirements; G

Anchor Bolts; G

Vibration Isolators; G

SD-05 Design Data

Design Calculations; G

SD-06 Test Reports

Post-installed Anchor Test Results; G

# PART 2 PRODUCTS

## 2.1 EQUIPMENT REQUIREMENTS

Submit detail drawings of bracing along with calculations, catalog cuts, templates, and erection and installation details, as appropriate, for the items listed in Paragraph 1.2.2. Indicate thickness, type, grade, class of metal, and dimensions; and show construction details, reinforcement, anchorage, and installation with relation to the building construction. Design must be based on actual equipment and system layout. Design must include calculated dead loads, static seismic loads and capacity of materials utilized for the connection of the equipment or system to the structure. Analysis must detail anchoring methods. For any rigid equipment which is rigidly anchored, provide flexible joints for piping, electrical conduit, etc., that are capable of accommodating displacements equal to the full width of the joint in both orthogonal directions.

### 2.1.1 Rigidly (Base and Suspended) Mounted Equipment

Equipment furnished under this contract must be rigidly mounted using cast-in-place anchor bolts to anchor them or post-installed anchors that are qualified for earthquake loading in accordance with the applicable provisions of the BSLJ. Suspended equipment bracing attachments should be located just above the center of gravity to minimize swinging. Components needed for continued operation after an earthquake must have two nuts provided on each anchor bolt.

### 2.1.2 Non-rigid or Flexibly-Mounted Equipment

Select vibration isolation devices so that the maximum movement of equipment from the static deflection point is 6 mm . Equipment flexibly mounted on vibration isolators must have a bumper restraint or snubber in each horizontal direction and vertical restraints must be provided where require to resist overturning. Isolator housing and restraints must be constructed of ductile materials. A visco-elastic pad or similar material of appropriate thickness must be used between the bumper and components to limit the impact load. Restraints must be designed to resist the calculated horizontal lateral and vertical forces.

## 2.2 BOLTS AND NUTS

Hex head bolts and hexagon nuts must be JIS B 1186. Provide hot dip galvanized bolts and nuts in accordance with JIS B 1048 when used underground or exposed to weather. Anchor bolts shall be threaded rod assemblies in accordance with JIS G 3138, SNR400B.

## 2.3 SWAY BRACING

Material used for members listed must be conforming with the following:

a. Plates, rods, and rolled shapes, JIS G 3101, JIS G 3106, JIS G 3114, JIS G 3136.

b. Wire rope, JIS G 3549, stainless steel (SUS304), 7x7 construction. A minimum of two clamps are required on each end of wire rope.

c. Tubes, JIS G 3444 or JIS G 3475.

d. Pipes, JIS G 3444 or JIS G 3466.

e. Angles, JIS G 3101, JIS G 3106, JIS G 3114, JIS G 3136.

f. Other profiles, such as channel struts with in-turned lips and associated hardware for fastening to struts at random points having been approved by the Minister of Land, Infrastructure, Transport and Tourism as a seismic restraint method of which safety has been confirmed by structural calculations that conform with criteria specified in the Building Standard Law.

# PART 3 EXECUTION

## 3.1 BRACING

Provide bracing conforming to the arrangements shown. Install cables at a 45-degree slope. Where interference is present, the slope may be minimum of 30 degrees or a maximum of 60 degrees. Submit details of equipment bracing for acceptance.

## 3.2 BUILDING DRIFT

Do not attach sway braces for equipment to two dissimilar structural elements of a building that may respond differentially during an earthquake unless a flexible joint is provided. Bracing must be capable of accommodating building drift due to seismic displacements.

## 3.3 ANCHOR BOLTS

### 3.3.1 General

Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices allowing adequate edge distance and embedment depth for restraint anchor bolts. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength. Install neoprene grommet washers or till the gap with epoxy on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 3 mm.

### 3.3.2 Cast-In-Place (New Structures Only)

Use templates to locate cast-in-place bolts accurately and securely in formwork. Provide anchor bolts with an embedded straight length equal to at least 12 times nominal diameter of the bolt. Anchor bolts that exceed the normal depth of equipment foundation piers or pads must either extend into concrete floor or the foundation or be increased in depth to accommodate bolt lengths. Use templates to locate cast-in-place bolts accurately and securely in formwork.

### 3.3.3 Drilled-In Anchor Bolts (New or Existing Structures)

Drill holes with rotary impact hammer drills. Drill bits must be of diameters as specified by the anchor manufacturer. All holes must be drilled perpendicular to the concrete surface. Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the COR if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines. Do not drill holes in new concrete or new masonry until concrete, mortar, or grout has achieved full design strength. Perform anchor installation in accordance with manufacturer instructions. For Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors, protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of the specified torque, 100 percent of the specified torque must be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor must be removed and replaced unless otherwise directed by the Engineer.

For Cartridge Injection Adhesive Anchors where approved for seismic application, clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive must be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed. For Capsule Anchors where approved for seismic application, perform drilling and setting operations in accordance with manufacturer instructions. Clean all holes to remove loose material and drilling dust prior to installation of adhesive. Remove water from drilled holes in such a manner as to achieve a surface dry condition. Capsule anchors must be installed with equipment conforming to manufacturer recommendations. Do not disturb or load anchors before manufacturer specified cure time has elapsed. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

### 3.3.4 Anchor Bolt Testing

Test in place expansion and chemically bonded anchors not more than 24 hours after installation of the anchor, conducted by an independent testing agency; testing must be performed on random anchor bolts as described below.

#### 3.3.4.1 Torque Wrench Testing

Perform torque wrench testing on not less than 25 percent of the total installed expansion anchors and at least one anchor for every piece of equipment containing more than two anchors. The test torque must equal the minimum required installation torque as required by the bolt manufacturer. Calibrate torque wrenches at the beginning of each day the torque tests are performed. Recalibrate torque wrenches for each bolt diameter whenever tests are run on bolts of various diameters. Reach the test torque within one half turn of the nut. If any anchor fails the test, increase testing to 100% of similar anchors (type of anchor, base material into which fastened) until 20 consecutive anchors pass. Failed anchors must be retightened and retested to the specified torque; if the anchor still fails the test it must be replaced.

#### 3.3.4.2 Pullout Testing

Test expansion and chemically bonded anchors by applying a pullout load using a hydraulic ram attached to the anchor bolt. At least 5 percent of the anchors, but not less than 3 per day must be tested. Apply the load to the anchor without removing the nut; when that is not possible, the nut must be removed and a threaded coupler must be installed of the same tightness as the original nut. Check the test setup to verify that the anchor is not restrained from withdrawing by the baseplate, the test fixture, or any other fixtures. The support for the testing apparatus must be at least 1.5 times the embedment length away from the bolt being tested. Load each tested anchor to 1.25 times the design tension value for the anchor. The anchor must have no observable movement at the test load. If any anchor fails the test, similar anchors not previously tested must be tested until 10 consecutive anchors pass. Failed anchors must be retightened and retested to the specified load; if the anchor still fails the test it must be replaced.

## 3.4 EQUIPMENT SWAY BRACING

### 3.4.1 Suspended Equipment

Provide equipment sway bracing for items supported from floor, overhead floor or roof structural systems. Provide braces that consist of angles, rods, wire rope, bars, channels (struts) or pipes arranged as shown in bracing submittals and secured at both ends with not less than 13 mm bolts. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45 degrees directed up and radially away from equipment and oriented symmetrically in 90-degree intervals on the horizontal plane, bisecting the angles of each corner of the equipment, provided that supporting members are properly sized to support operating weight of equipment when hangers are inclined at a 45-degree angle.

### 3.4.2 Floor or Pad Mounted Equipment

#### 3.4.2.1 Shear Resistance

Bolt to the floor, floor mounted equipment. Provide the number and installation of bolts to resist shear forces in accordance with paragraph ANCHOR BOLTS.

#### 3.4.2.2 Overturning Resistance

Use the ratio of the overturning moment from seismic forces to the resisting moment due to gravity loads to determine if overturning forces need to be considered in the sizing of anchor bolts. Provide calculations to verify the adequacy of the anchor bolts for combined shear and overturning.

## 3.5 SPECIAL TESTING FOR SEISMIC-RESISTING EQUIPMENT

Miscellaneous components that are required to be certified must bear permanent marking or nameplates constructed of a durable heat and water resistant material. Nameplates must be mechanically attached to such nonstructural components and placed on each component for clear identification. The nameplate must not be less than 12 cm x 18 cm with red letters 1 cm in height on a white background stating "Certified Equipment." The following statement must be on the nameplate: "This equipment/component is certified. No modifications are allowed unless authorized in advance and documented in the Equipment Certification Documentation file." The nameplate must also contain the component identification number in accordance with the drawings/specifications and the O&M manuals.

## 3.6 INSPECTION AND TESTS FOR SEISMIC-RESISTING EQUIPMENT AND BRACING

Perform inspections for seismic-resisting equipment and bracing in accordance with the applicable requirements of the BSLJ. Submit Post-installed Anchor Test Results to the COR for record.

-- End of Section --

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DIVISION 21 - FIRE SUPPRESSION

SECTION 21 13 13

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**08/20**

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# SECTION 21 13 13

# WET PIPE SPRINKLER SYSTEMS, FIRE PROTECTION
**08/20**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

| | |
|---|---|
| ASME B16.1 | (2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250 |
| ASME B16.3 | (2016) Malleable Iron Threaded Fittings, Classes 150 and 300 |
| ASME B16.4 | (2016) Standard for Gray Iron Threaded Fittings; Classes 125 and 250 |
| ASME B16.21 | (2016) Nonmetallic Flat Gaskets for Pipe Flanges |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A47/A47M | (1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings |
| ASTM A53/A53M | (2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM A135/A135M | (2009; R2014) Standard Specification for Electric-Resistance-Welded Steel Pipe |
| ASTM A153/A153M | (2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| ASTM A183 | (2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts |
| ASTM A536 | (1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings |

FM GLOBAL (FM)

| | |
|---|---|
| FM APP GUIDE | (updated on-line) Approval Guide http://www.approvalguide.com/ |

INTELLIGENCE COMMUNITY STANDARD (ICS)

| | |
|---|---|
| ICS 705-1 | (2010) Physical and Technical Security Standard for Sensitive Compartmented Information Facilities |

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

| | |
|---|---|
| MSS SP-71 | (2018) Gray Iron Swing Check Valves, Flanged and Threaded Ends |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 13 | (2019; ERTA 1 2018; TIA 18-1; TIA 18-2; ; ERTA 2-3 2019; TIA 19-3; TIA 19-4; TIA 19-5; TIA 19-6; ERTA 4 2019; ERTA 5 2020) Standard for the Installation of Sprinkler Systems |
| NFPA 13R | (2019) Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height |
| NFPA 24 | (2019; TIA 19-1) Standard for the Installation of Private Fire Service Mains and Their Appurtenances |
| NFPA 101 | (2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code |

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

| | |
|---|---|
| NICET 1014-7 | (2012) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 199 | (2020) UL Standard for Safety Automatic Sprinklers for Fire-Protection Service |
| UL 312 | (2010; Reprint Mar 2018) UL Standard for Safety Check Valves for Fire-Protection Service |
| UL 1626 | (2008; Bul. 2018) UL Standard for Safety Residential Sprinklers for Fire-Protection Service |
| UL Fire Prot Dir | (2020) Fire Protection Equipment Directory |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS B 2301 | (2013) Screwed Type Malleable Cast Iron Pipe Fittings |
| JIS B 2311 | (2015) Steel Butt-Welding Pipe Fittings for Ordinary Use |
| JIS G 3454 | (2019) Carbon Steel Pipes for Pressure Service (Amendment 1) |

## 1.2 SYSTEM DESCRIPTION

Provide the modifications of the wet pipe sprinkler system(s) in areas indicated on the drawings. Except as modified herein, the system must meet the requirements of NFPA 13.

### 1.2.1 Sprinkler Coverage

Provide coverage throughout 100 percent of the area noted on the Contract drawings. This includes, but is not limited to, telephone rooms, electrical equipment rooms (regardless of the fire resistance rating of the enclosure), boiler rooms, switchgear rooms, transformer rooms, attached electrical vaults and other electrical and mechanical spaces. Coverage per sprinkler must be in accordance with NFPA 13. Provide sprinklers below all obstructions in accordance with NFPA 13. Exceptions are as follows:

a. Sprinklers may be omitted from small rooms which are exempted for specific occupancies in accordance with NFPA 101.

b. Facilities that are designed in accordance with NFPA 13R.

### 1.2.2 Qualified Fire Protection Engineer (QFPE)

An individual who is a licensed professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveying (NCEES) and has relevant fire protection engineering experience. Services of the QFPE must include:

a. Reviewing SD-02, SD-03, and SD-06 submittal packages for completeness and compliance with the provisions of this specification. Working (shop) drawings and calculations must be prepared by, or prepared under the immediate supervision of, the QFPE. The QFPE must affix their professional engineering stamp with signature to the shop drawings, calculations, and material data sheets, indicating approval prior to submitting the shop drawings to the DFPE.

b. Provide a letter documenting that the SD-02, SD-03, and SD-06 submittal package has been reviewed and noting all outstanding comments.

c. Performing in-progress construction surveillance prior to installation of ceilings (rough-in inspection).

d. Witnessing pre-Government and final Government functional performance testing and performing a final installation review.

e. Signing applicable certificates under SD-07.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Partial submittals and submittals not fully complying with NFPA 13 and this specification section must be returned disapproved without review. SD-02, SD-03 and SD-05 must be submitted simultaneously.

Shop drawings (SD-02), product data (SD-03) and calculations (SD-05) must be prepared by the designer and combined and submitted as one complete package. The QFPE must review the SD-02/SD-03/SD-05 submittal package for completeness and compliance with the Contract provisions prior to submission to the Government. The QFPE must provide a Letter of Confirmation that they have reviewed the submittal package for compliance with the contract provisions. This letter must include their professional engineer stamp and signature. Partial submittals and submittals not reviewed by the QFPE must be returned disapproved without review.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualified Fire Protection Engineer (QFPE); G

Sprinkler System Designer; G

Sprinkler System Installer; G

SD-02 Shop Drawings

Shop Drawing; G

SD-03 Product Data

Pipe; G

Fittings; G

Valves, including gate, check, butterfly, and globe; G

Sprinklers; G

Pipe Hangers and Supports; G

Nameplates; G

SD-06 Test Reports

Test Procedures; G

SD-07 Certificates

Verification of Compliant Installation; G

Request for Government Final Test; G

SD-10 Operation and Maintenance Data

Operating and Maintenance (O&M) Instructions; G

Spare Parts Data; G

SD-11 Closeout Submittals

As-built drawings

## 1.4 QUALITY ASSURANCE

### 1.4.1 Preconstruction Submittals

Within 36 days of Notice to Proceed (NTP) but no less than 14 days prior to commencing work on site, the prime Contractor must submit the following for review and approval. SD-02, SD-03 and SD-05 submittals received prior to the review and approval of the qualifications will be returned Disapproved Without Review.

#### 1.4.1.1 Shop Drawing

3 copies of the shop drawings, no later than 28 days prior to the start of system installation. Working drawings conforming to the requirements prescribed in NFPA 13 and must be no smaller than the Contract Drawings. Each set of drawings must include the following:

1. A descriptive index with drawings listed in sequence by number. A legend sheet identifying device symbols, nomenclature, and conventions used in the package.

2. Floor plans drawn to a scale not less than 1:100 equals 1-foot clearly showing locations of devices, equipment, risers, and other details required to clearly describe the proposed arrangement.

3. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross mains and branch lines to finished floor and roof or ceiling. A detail must show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

4. Longitudinal and transverse building sections showing typical branch line and cross main pipe routing, elevation of each typical sprinkler above finished floor and elevation of "cloud" or false ceilings in relation to the building ceilings.

5. Plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance.

6. Riser layout drawings drawn to a scale of not less than 1:25 equals 1-foot to show details of each system component, clearances between each other and from other equipment and construction in the room.

7. Details of each type of pipe hanger.

8. Details of each type of pipe hanger and related components.

#### 1.4.1.2 Product Data

3 copies of annotated catalog data to show the specific model, type, and size of each item. Catalog cuts must also indicate the NRTL listing. The data must be highlighted to show model, size, options, and other pertinent information, that are intended for consideration. Data must be adequate to demonstrate compliance with all contract requirements. Product data for all equipment must be combined into a single submittal.

#### 1.4.1.3 Operating and Maintenance (O&M) Instructions

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA as supplemented and modified by this specification section.

Provide six manuals and one pdf version on electronic media. The manuals must include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.

Submit spare parts data for each different item of material and equipment specified. The data must include a complete list of parts and supplies, and a list of parts recommended by the manufacturer to be replaced after 1-year and 3 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied.

### 1.4.2 Qualifications

#### 1.4.2.1 Sprinkler System Designer

The sprinkler system designer must be certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in the Water-Based Systems Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7.

#### 1.4.2.2 Sprinkler System Installer

The sprinkler system installer must be regularly engaged in the installation of the type and complexity of system specified in the contract documents, and must have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

### 1.4.3 Regulatory Requirements

Equipment and material must be listed or approved. Listed or approved, as used in this Section, means listed, labeled or approved by a Nationally Recognized Testing Laboratory (NRTL) such as UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of an item or equipment described must not be construed as waiving this requirement. All listings or approvals by testing laboratories must be from an existing ANSI or UL published standard. The recommended practices stated in the manufacturer's literature or documentation are mandatory requirements.

## 1.5 DELIVERY, STORAGE, AND HANDLING

Protect all equipment delivered and placed in storage from the weather,

excessive humidity and temperature variations, dirt and dust, or other contaminants. All pipes must be either capped or plugged until installed.

## 1.6 EXTRA MATERIALS

Spare sprinklers and wrench(es) must be provided as spare parts in accordance with NFPA 13.

# PART 2 PRODUCTS

## 2.1 MATERIALS AND EQUIPMENT

### 2.1.1 Standard Products

Provide materials, equipment, and devices listed for fire protection service when so required by NFPA 13 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for a classification of material. Material and equipment must be standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid.

### 2.1.2 Nameplates

Major components of equipment must have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new name plate permanently affixed to the item or equipment. Nameplates must be etched metal or plastic, permanently attached by screws to control units, panels or adjacent walls.

### 2.1.3 Identification and Marking

Pipe and fitting markings must include name or identifying symbol of manufacturer and nominal size. Pipe must be marked with ASTM designation. Valves and equipment markings must have name or identifying symbol of manufacturer, specific model number, nominal size, name of device, arrow indicating direction of flow, and position of installation (horizontal or vertical), except if valve can be installed in either position. Markings must be included on the body casting or on an etched or stamped metal nameplate permanently on the valve or cover plate.

### 2.1.4 Pressure Ratings

Valves, fittings, couplings, alarm switches, and similar devices must be rated for the maximum working pressures that can be experienced in the system, but in no case less than 1207 kPa.

## 2.2 ABOVEGROUND PIPING COMPONENTS

### 2.2.1 Steel Piping Components

#### 2.2.1.1 Steel Pipe

Except as modified herein, steel pipe must be black as permitted by NFPA 13 and conform to the applicable provisions of ASTM A53/A53M, ASTM A135/A135M , ASTM A153/A153M, or JIS G 3454 - STPG370.

Steel pipe must be Schedule 40 for all piping less than 65 mm and schedule 10 or 40 for piping 65 mm or greater. all threaded piping shall be

schedule 40. Galvanized pipe is not permitted.

2.2.1.2 Fittings

Fittings must be welded, threaded, or grooved-end type. Threaded fittings must be cast-iron conforming to ASME B16.4, malleable-iron conforming to ASME B16.3 or JIS B 2301, ductile-iron conforming to ASTM A536, or steel butt-welded fittings to JIS B 2311. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe, steel press fittings and field welded fittings are not permitted. Fittings, mechanical couplings, and rubber gaskets must be supplied by the same manufacturer. Threaded fittings must use Teflon tape or manufacturer's approved joint compound. Saddle tees using rubber gasketed fittings are permitted only when connecting to existing piping for additions or modifications. Saddle tees must use a connection method that completely wraps around the pipe. Reducing couplings are not permitted except as allowed by NFPA 13. Galvanized fittings are not permitted.

2.2.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings must be designed for not less than 1200 kPa service and the product of the same manufacturer. Field welded fittings must not be used. Fitting and coupling housing must be malleable-iron conforming to ASTM A47/A47M, Grade 32510; ductile-iron conforming to ASTM A536, Grade 65-45-12. Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 50 mm and larger. Gasket must be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts must be heat-treated steel conforming to ASTM A183 and must be cadmium-plated or zinc-electroplated.

2.2.1.4 Flanges

Flanges must conform to NFPA 13 and ASME B16.1. Gaskets must be non-asbestos compressed material in accordance with ASME B16.21, 1.6 mm thick, and full face or self-centering flat ring type.

2.2.2 Flexible Sprinkler Hose

The use of flexible hose is not permitted.

2.2.3 Pipe Hangers and Supports

Provide galvanized pipe hangersand supports in accordance with NFPA 13.

2.2.4 Valves

Provide valves of types approved for fire service. Valves must open by counterclockwise rotation.

2.2.4.1 Control Valve

Manually operated sprinkler control/gate valve must be outside stem and yoke (OS&Y) type or butterfly type and must be listed.

2.2.4.2 Check Valves

Check valves must comply with UL 312. Check valves 100 mm and larger must be of the swing type, have a clear waterway and meet the requirements of MSS SP-71, for Type 3 or 4. Inspection plate must be provided on valves

larger than 150 mm.

## 2.3 SPRINKLERS

Sprinklers must comply with UL 199 and NFPA 13. Sprinklers with internal O-rings are not acceptable. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters must have temperature classification in accordance with NFPA 13. Extended coverage sprinklers are permitted for loading docks, residential occupancies and high-piled storage applications only.

### 2.3.1 Pendent Sprinkler

Pendent sprinkler must be recessed quick-response type with nominal K-factor of 80. Pendent sprinklers must have a white polyester finish. Assembly must include an integral escutcheon.

### 2.3.2 Upright Sprinkler

Upright sprinkler must be brass quick-response type and have a nominal K-factor of 115.

### 2.3.3 Sidewall Sprinkler

Sidewall sprinkler must be the quick-response type. Sidewall sprinkler must have a nominal K-factor of 80. Sidewall sprinkler must have a white polyester finish.

### 2.3.4 Concealed Sprinkler

Concealed sprinkler must be chrome-plated quick-response type and have a nominal K-factor of 80. Coverplate must be factory painted to match surface.

### 2.3.5 Residential Sprinkler

Residential sprinkler must be recessed pendent type with nominal K-factor of 80. Residential sprinkler must have a white polyester finish. Sprinkler must comply with UL 1626.

### 2.3.6 Corrosion-Resistant Sprinkler

Corrosion-resistant sprinkler must be the uprightpendent type installed in locations as indicated. Corrosion-resistant coatings must be factory-applied by the sprinkler manufacturer.

## 2.4 ACCESSORIES

### 2.4.1 Sprinkler Cabinet

Provide spare sprinklers in accordance with NFPA 13 and must be placed in a suitable metal or plastic cabinet of sufficient size to accommodate all the spare sprinklers and wrenches in designated locations. Spare sprinklers must be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed as required by NFPA 13. At least one wrench of each type required must be provided.

### 2.4.2 Pendent Sprinkler Escutcheon

Escutcheon must be one-piece metallic type with a depth of less than 19 mm and suitable for installation on pendent sprinklers. The escutcheon must have a factory finish that matches the pendent sprinkler.

### 2.4.3 Pipe Escutcheon

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

### 2.4.4 Sprinkler Guard

Listed guard must be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards must be provided on sprinklers located within 2.1 meters of the floor.

### 2.4.5 Identification Sign

Valve identification sign must be minimum 150 mm wide by 50 mm high with enamel baked finish on minimum 1.214-mm steel or 0.6-mm aluminum with red letters on a white background or white letters on red background. Wording of sign must include, but not be limited to "main drain", "auxiliary drain", "inspector's test", "alarm test", "alarm line", and similar wording as required to identify operational components. Where there is more than one sprinkler system, signage must include specific details as to the respective system.

## PART 3 EXECUTION

### 3.1 VERIFYING ACTUAL FIELD CONDITIONS

Before commencing work, examine all adjoining work on which the contractor's work that is dependent for perfect workmanship according to the intent of this specification section, and report to the Contracting Officer's Representative a condition that prevents performance of first class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

### 3.2 INSTALLATION

The installation must be in accordance with the applicable provisions of NFPA 13, NFPA 24 and publications referenced therein. Locate sprinklers in a consistent pattern with ceiling grid, lights, and air supply diffusers. Install sprinkler system over and under ducts, piping and platforms when such equipment can negatively affect or disrupt the sprinkler discharge pattern and coverage.

a. Piping offsets, fittings, and other accessories required must be furnished to provide a complete installation and to eliminate interference with other construction.

b. Wherever the contractor's work interconnects with work of other trades the Contractor must coordinate with other Contractors to insure all Contractors have the information necessary so that they may properly install all necessary connections and equipment. Identify all work

items needing access (dampers and similar equipment) that are concealed above hung ceilings by permanent color coded pins/tabs in the ceiling directly below the item.

c. Provide required supports and hangers for piping, conduit, and equipment so that loading will not exceed allowable loadings of structure. Submittal of a bid must be a deemed representation that the contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated in furnishing required supports.

### 3.2.1 Waste Removal

At the conclusion of each day's work, clean up and stockpile on site all waste, debris, and trash which may have accumulated during the day as a result of work by the contractor and of his presence on the job. Sidewalks and streets adjoining the property must be kept broom clean and free of waste, debris, trash and obstructions caused by work of the contractor, which will affect the condition and safety of streets, walks, utilities, and property.

## 3.3 ABOVEGROUND PIPING INSTALLATION

The methods of fabrication and installation of the aboveground piping must fully comply with the requirements and recommended practices of NFPA 13 and this specification section.

### 3.3.1 Protection of Piping Against Earthquake Damage

Seismic restraint is required.

### 3.3.2 Piping in Exposed Areas

Install exposed piping without diminishing exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, must be installed to provide maximum headroom.

### 3.3.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping must be concealed above ceilings. Piping must be inspected, hydrostatically tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas must be concealed.

### 3.3.4 Pendent Sprinklers

a. Drop nipples to pendent sprinklers must consist of minimum 25-mm pipe with a reducing coupling into which the sprinkler must be threaded.

b. Where sprinklers are installed below suspended or dropped ceilings, drop nipples must be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling must not extend below the underside of the ceiling.

c. Recessed pendent sprinklers must be installed such that the distance from the sprinkler deflector to the underside of the ceiling must not exceed the manufacturer's listed range and must be of uniform depth

throughout the finished area.

d. Pendent sprinklers in suspended ceilings must be located in the center of the tile (+/- 2 inches).

3.3.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers must contain no fittings between the branch line tee and the reducing coupling at the sprinkler.

3.3.6 Pipe Joints

Pipe joints must conform to NFPA 13, except as modified herein. Not more than four threads must show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints must be provided where indicated or required by NFPA 13. Grooved pipe and fittings must be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools must be products of the same manufacturer. The diameter of grooves made in the field must be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe must be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances.

3.3.7 Reducers

Reductions in pipe sizes must be made with one-piece tapered reducing fittings. When standard fittings of the required size are not manufactured, single bushings of the face or hex type will be permitted. Where used, face bushings must be installed with the outer face flush with the face of the fitting opening being reduced. Bushings cannot be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 13 mm.

3.3.8 Pipe Penetrations

a. Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors must be core-drilled and provided with pipe sleeves. Each sleeve must be Schedule 40 galvanized steel, ductile-iron or cast-iron pipe and extend through its respective wall or floor and be cut flush with each wall surface. Sleeves must provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe must be firmly packed with mineral wool insulation.

b. Where pipes and sleeves penetrate fire walls, fire partitions, or floors, pipes/sleeves must be firestopped in accordance with Section 07 84 00 FIRESTOPPING.

c. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe must be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

d. All penetrations through the boundary of rooms/areas identified as secure space area must meet ICS 705-1.

### 3.3.9 Escutcheons

Escutcheons must be provided for pipe penetration in finished areas of ceilings, floors and walls. Escutcheons must be securely fastened to the pipe at surfaces through which piping passes.

### 3.3.10 Identification Signs

Signs must be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Main drain test results must be etched into main drain identification sign. Hydraulic design data must be etched into the nameplates and permanently affixed to each sprinkler riser as specified in NFPA 13. Provide labeling on the surfaces of all feed and cross mains to show the pipe function (e.g., "Sprinkler System", "Fire Department Connection", "Standpipe") and normal valve position (e.g. "Normally Open", "Normally Closed"). For pipe sizes 100 mm and larger provide white painted stenciled letters and arrows, a minimum of 50 mm in height and visible from at least two sides when viewed from the floor. For pipe sizes less than 100 mm, provide white painted stenciled letters and arrows, a minimum of 18 mm in height and visible from the floor.

## 3.4 ELECTRICAL

Except as modified herein, electric equipment and wiring must be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system must be by the fire alarm installer.

## 3.5 PAINTING

Color code mark piping red.

## 3.6 FIELD QUALITY CONTROL

### 3.6.1 Test Procedures

Submit detailed test procedures, prepared and signed by the NICET Level III or IV Fire Sprinkler Technician, and the representative of the installing company, and reviewed by the QFPE 60 days prior to performing system tests. Detailed test procedures must list all components of the installed system. Test procedures must include sequence of testing, time estimate for each test, and sample test data forms. The test data forms must be in a check-off format (pass/fail with space to add applicable test data; similar to the forms in NFPA 13 .) The test procedures and accompanying test data forms must be used for the pre-Government testing and the Government final testing.

a. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

### 3.6.2 Pre-Government Testing

#### 3.6.2.1 Verification of Compliant Installation

Conduct inspections and tests to ensure that equipment is functioning properly. Tests must meet the requirements of paragraph entitled "Minimum System Tests" and "System Acceptance" as noted in NFPA 13. The Contractor and QFPE must be in attendance at the pre-Government testing to make necessary adjustments. After inspection and testing is complete, provide a signed Verification of Compliant Installation letter by the QFPE that the installation is complete, compliant with the specification and fully operable. The letter must include the names and titles of the witnesses to the pre-Government tests. Provide all completion documentation as required by NFPA 13 and the test reports noted below.

a. NFPA 13 Aboveground Material and Test Certificate

b. NFPA 13 Underground Material and Test Certificate

#### 3.6.2.2 Request for Government Final Test

When the verification of compliant installation has been completed, submit a formal request for Government final test to the Contracting Officers Designated Representative (COR). Government final testing will not be scheduled until the DFPE has received copies of the request for Government final testing and Verification of Compliant Installation letter with all required reports. Government final testing will not be performed until after the connections to the building fire alarm system have been completed and tested to confirm communications are fully functional. Submit request for test at least 15 calendar days prior to the requested test date.

### 3.6.3 Correction of Deficiencies

If equipment was found to be defective or non-compliant with contract requirements, perform corrective actions and repeat the tests. Tests must be conducted and repeated if necessary until the system has been demonstrated to comply with all contract requirements.

### 3.6.4 Government Final Tests

The tests must be performed in accordance with the approved test procedures in the presence of the DFPE. Furnish instruments and personnel required for the tests. The following must be provided at the job site for Government Final Testing:

a. The manufacturer's technical representative.

b. The contractor's Qualified Fire Protection Engineer (QFPE).

c. Marked-up red line drawings of the system as actually installed.

Government Final Tests will be witnessed by the , Designated Fire Protection EngineerContracting Officer, Qualified Fire Protection Engineer (QFPE). At this time, all required tests noted in the paragraph "Minimum System Tests" must be repeated at their discretion.

## 3.7 MINIMUM SYSTEM TESTS

The system, including the underground water mains, and the aboveground piping and system components, must be tested to ensure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure must be tested in accordance with NFPA 13 and NFPA 24.

### 3.7.1 Underground Piping

#### 3.7.1.1 Flushing

Underground piping must be flushed at a minimum of 3 mps in accordance with NFPA 24.

#### 3.7.1.2 Hydrostatic Test

New underground piping must be hydrostatically tested in accordance with NFPA 24.

### 3.7.2 Aboveground Piping

#### 3.7.2.1 Hydrostatic Test

Aboveground piping must be hydrostatically tested in accordance with NFPA 13. There must be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure must be read from a gauge located at the low elevation point of the system or portion being tested.

#### 3.7.2.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly must be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor must provide all equipment and instruments necessary to conduct a complete forward flow test, including 65-mm diameter hoses, playpipe nozzles or flow diffusers, calibrated pressure gauges, and pitot tube gauge. The Contractor must provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction loss) across the assembly must be recorded. A metal placard must be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate determined during the preliminary testing. The pressure drop must be compared to the manufacturer's data and the readings observed during the final inspections and tests.

### 3.7.3 Main Drain Flow Test

Following flushing of the underground piping, a main drain test must be made to verify the adequacy of the water supply. Static and residual pressures must be recorded on the certificate specified in paragraph SUBMITTALS.

## 3.8 SYSTEM ACCEPTANCE

Following acceptance of the system, as-built drawings and O&M manuals must be delivered to the Contracting Officer for review and acceptance. Submit six sets of detailed as-built drawings. The drawings must show the system

as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings must be provided at the time of, or prior to the final acceptance test.

a. Provide one set of full size paper as-built drawings and schematics. The drawings must be prepared electronically and sized no less than the contract drawings. Furnish one set of CDs or DVDs containing software back-up and CAD based drawings in latest version of AutoCAD, DXF and portable document formats of as-built drawings and schematics.

b. Provide operating and maintenance (O&M) instructions.

## 3.9 ONSITE TRAINING

Conduct a training course for the responding fire department and operating and maintenance personnel as designated by the Contracting Officer. Training must be performed on two separate days (to accommodate different shifts of Fire Department personnel) for a period of 4 hours of normal working time and must start after the system is functionally complete and after the final acceptance test. The on-site training must cover all of the items contained in the approved Operating and Maintenance Instructions.

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### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

| | |
|---|---|
| ASME B1.20.1 | (2013; R 2018) Pipe Threads, General Purpose (Inch) |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM B88 | (2020) Standard Specification for Seamless Copper Water Tube |
| ASTM B88M | (2020) Standard Specification for Seamless Copper Water Tube (Metric) |
| ASTM D2846/D2846M | (2019) Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems |
| ASTM F877 | (2020) Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems |

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
|---|---|
| PL 93-523 | (1974; A 1999) Safe Drinking Water Act |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 90A | (2021) Standard for the Installation of Air Conditioning and Ventilating Systems |

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

| | |
|---|---|
| PPFA Fire Man | (2016) Firestopping: Plastic Pipe in Fire Resistive Construction |

JAPAN WATER WORKS ASSOCIATION (JWWA)

| | |
|---|---|
| JWWA K 115 | (2018) Tar Epoxy Resin Paint of Water Works and Painting Method |
| JWWA K 120 | (2008) Water Works Sodium Hypochlorite |
| JWWA S 101 | (2019) Polyethylene Pipe Fitting for Water |

Distribution

JAPANESE INDUSTRIAL STANDARDS (JIS)

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| JIS A 5207 | (2014) Sanitary Wares |
| JIS A 5758 | (2016) Sealants for Sealing and Glazing in Buildings |
| JIS A 6005 | (2005) Asphalt Roofing Felts |
| JIS B 0203 | (1999) Taper Pipe Threads |
| JIS B 2003 | (2013) General Rules for Inspection of Valves |
| JIS B 2004 | (1994) General Rules for Marking on Valves |
| JIS B 2011 | (2013) Bronze, Gate, Globe, Angle, and Check Valves (Amendment 2) |
| JIS B 2031 | (2015) Gray Cast Iron Valves (Amendment 1) |
| JIS B 2061 | (2017) Faucets, Ball Taps and Flush Valves |
| JIS B 2071 | (2000) Steel Valves |
| JIS B 2220 | (2012) Steel Pipe Flanges |
| JIS B 2404 | (2018) Dimensions of Gaskets for Use with Pipe Flanges |
| JIS B 7414 | (2018) Glass Thermometers |
| JIS B 7505-1 | (2017) Aneroid Pressure Gauges-Part 1: Bourdon Tube Pressure Gauges |
| JIS B 8225 | (2012) Safety Valves-Measuring Methods for Coefficient of Discharge |
| JIS B 8285 | (2010) Welding Procedure Qualification Test for Pressure Vessels |
| JIS B 8372-1 | (2003) Pneumatic Fluid Power-Compressed Air Pressure Regulators and Filter-Regulators-Part 1: Main Characteristics to be Included in Literature from Suppliers and Product-Making Requirements |
| JIS B 8410 | (2015) Pressure Reducing Valves for Water Works |
| JIS B 8414 | (2011) Relief Valves for Hot Water Appliances (Amendment 3) |
| JIS B 8570-1 | (2013) Meters for Cold Water and Hot Water - Part 1: General Specifications |

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| JIS C 4212 | (2010) Low-Voltage Three-Phase Squirrel-Cage High-Efficiency Induction Motors (Amendment 1) |
| JIS C 9219-1 | (2005) Electric Storage Tank Water Heaters |
| JIS G 3103 | (2012) Carbon Steel and Molybdenum Alloy Steel Plates for Boilers and Pressure Vessels |
| JIS G 3118 | (2017) Carbon Steel Plates for Pressure Vessels for Intermediate and Moderate Temperature Services |
| JIS G 3201 | (2008) Carbon Steel Forgings for General Use (Amendment 1) |
| JIS G 4051 | (2018) Carbon Steels for Machine Structural Use (Amendment 1) |
| JIS G 4107 | (2015) Alloy Steel Bolting Materials for High Temperature Service (Amendment 1) |
| JIS G 4303 | (2012) Stainless Steel Bars |
| JIS G 5526 | (2014) Ductile Iron Pipes |
| JIS G 5705 | (2018) Malleable Iron Castings |
| JIS H 3300 | (2018) Copper and Copper Alloy Seamless Pipes and Tubes |
| JIS K 6353 | (2011) Rubber Goods for Water Works |
| JIS K 6739 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipe Fittings for Drain |
| JIS K 6741 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipes |
| JIS S 3200-3 | (1997) Equipment for Water Supply Service-Test Method of Water Hammer |
| JIS S 3200-5 | (1997) Equipment for Water Supply Service-Test Methods of Destruction by Vacuum Pressure |
| JIS S 3200-7 | (2010) Equipment for Water Supply Service-Test Methods of Effect to Water Quality (Amendment 2) |
| JIS S 3201 | (2017) Testing Methods for Household Water Purifiers |
| JIS Z 2371 | (2015) Methods of Salt Spray Testing |
| JIS Z 3284-1 | (2014) Solder Paste-Part 1: Kinds and Quality Classification |

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| JIS Z 3313 | (2009) Flux Cored Wires for Gas Shielded and Self-Shielded Metal Arc Welding of Mild Steel, High Strength Steel and Low Temperature Service Steel |
| JIS Z 3621 | (2014) Recommended Practice for Brazing |
| JIS Z 3801 | (2018) Standard Qualification Test and Acceptance Requirements for Manual Welding Technique |
| JIS Z 9102 | (1987) Identification Marking for Piping Systems |

JAPAN VALVE MANUFACTURERS ASSOCIATION

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|---|---|
| JV-5 | (2008) Pipe end Anticorrosion Screwed Valve |

JAPAN PIPE FITTINGS ASSOCIATION (JPFA)

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| JPF-MP-006 | (2019) Rool Grooving Dimension Fitting |
| JPF-DP-001 | (2010) Screwed Cast Iron Fitting |

JAPAN CAST IRON COVER & WASTE FITTING ASSOCIATION (JCW)

| | |
|---|---|
| JCW 203 | (2012) Floor Clean Out |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
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| MLIT-M | (2019) Public Building Construction Standard Specification |

NSF INTERNATIONAL (NSF)

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| NSF 372 | (2016) Drinking Water System Components - Lead Content |
| NSF/ANSI 14 | (2021) Plastics Piping System Components and Related Materials |
| NSF/ANSI 61 | (2020) Drinking Water System Components - Health Effects |

MINISTRY OF HEALTH, LABOUR AND WELFARE, GOVERNMENT OF JAPAN (MHLW)

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| | INDUSTRIAL SAFETY AND HEALTH ACT |
| PSCP | Performance Standard Compliant Product |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System; G

Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

SD-03 Product Data

Water Heaters

Pumps

Backflow Prevention Assemblies

SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

Test of Backflow Prevention Assemblies; G

Certification of proper operation shall be as accomplished in accordance with state regulations by an individual certified by the state to perform such tests. If no state requirement exists, the Contractor shall have the manufacturer's representative test the device, to ensure the unit is properly installed and performing as intended. The Contractor shall provide written documentation of the tests performed and signed by the individual performing the tests.

SD-10 Operation and Maintenance Data

Plumbing System

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## 1.3 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening.

Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

### 1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

### 1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

### 1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

### 1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

#### 1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

#### 1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

## 1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

## 1.5 PERFORMANCE REQUIREMENTS

### 1.5.1 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with JIS Z 3801. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by JIS B 8285. The Contracting Officer shall be notified 24 hours in advance of tests, and the tests shall be performed at the work site if practicable. Welders or welding operators shall apply their assigned symbols near each weld they make as a permanent record.

## 1.6 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with MLIT-M.

## 1.7 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

## 1.8 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

## 1.9 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves,

expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

# PART 2 PRODUCTS

## 2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and II. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF/ANSI 61, Annex G or NSF 372. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with or PL 93-523 and NSF/ANSI 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF/ANSI 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

### 2.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used underground. Solder containing lead shall not be used with copper pipe.

a. Coupling for Cast-Iron Pipe: for hub and spigot type JIS G 5526, JPF-MP-006. For hubless type: JIS G 5526.

b. Coupling for Steel Pipe: JPF-MP-006.

c. Couplings for Grooved Pipe:Malleable Iron JIS G 5705.

d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with JIS B 2404. Gaskets shall be flat, 1.6 mm thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.

e. Brazing Material: Brazing material shall conform to JIS Z 3621.

f. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.

g. Solder Material: Solder metal shall conform to JIS Z 3284-1.

h. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to

JIS Z 3313.

i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.

j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): JIS K 6353.

k. Rubber Gaskets for Grooved Pipe: JIS B 2404.

l. Flexible Elastomeric Seals: JIS A 5758.

m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, JIS G 4051.

n. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: JWWA S 101.

o. Plastic Solvent Cement for CPVC Plastic Pipe: JWWA S 101.

p. Flanged fittings including, but not limited to, flanges, bolts, nuts and bolt patterns shall be in accordance with JIS B 2220 and shall have the manufacturer's trademark affixed in accordance with JIS B 2004 and JIS Z 9102. Flange material shall conform to JIS G 3201. Blind flange material shall conform to JIS G 3118 and JIS G 3118 cold service and JIS G 3103 and JIS G 3118 for hot service. Bolts shall be high strength or intermediate strength with material conforming to JIS G 4107 and JIS G 4303.

q. Copper tubing shall conform toJIS H 3300, Type K, L or M.

2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

a. Water Hammer Arrester: Performance standards of products conforming to the Japanese Water Supply Law. Water hammer arrester shall be diaphragm.

b. Asphalt Roof Cement: JIS A 6005.

c. Hose Clamps: MLIT-M.

d. Metallic Cleanouts: JCW 203.

e. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.

f. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: JWWA K 115.

g. Liquid Chlorine: JWWA K 120.

h. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: JIS B 7505-1.

i. Thermometers: JIS B 7414. Mercury shall not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MLIT-M.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 65 mm and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 80 mm and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves shall conform to the following standards:

| Description | Standard |
|---|---|
| Butterfly Valves | JPF-DP-001 |
| Cast-Iron Gate Valves, Flanged and Threaded Ends | JIS B 2031 |
| Cast-Iron Swing Check Valves, Flanged and Threaded Ends | JIS B 2011 |
| Ball Valves with Flanged Butt-Welding Ends for General Service | JV-5 |
| Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends | JV-5 |
| Bronze Gate, Globe, Angle, and Check Valves | JV-5 |
| Steel Valves, Socket Welding and Threaded Ends | JIS B 2003 |
| Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends | JIS B 2071 |
| Backwater Valves | |
| Vacuum Relief Valves | JIS B 8372-1 and JIS B 8225 |

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|---|---|
| Water Pressure Reducing Valves | JIS B 8410 |
| Water Heater Drain Valves | JIS B 2011 |
| Trap Seal Primer Valves | JIS B 2061 |
| Temperature and Pressure Relief Valves for Hot Water Supply Systems | JIS B 8414 and JIS B 2011 |
| Temperature and Pressure Relief Valves for Automatically Fired Hot Water Boilers | JIS B 8414 |

### 2.3.1 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer shall be brass with 20 mm male inlet threads, hexagon shoulder, and 20 mm hose connection. Faucet handle shall be securely attached to stem.

### 2.3.2 Relief Valves

Water heaters and hot water storage tanks shall have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves shall be rated according to JIS B 8225. Relief valves for systems where the maximum rate of heat input is less than 59 kW shall have 20 mm minimum inlets, and 20 mm outlets. Relief valves for systems where the maximum rate of heat input is greater than 59 kW shall have 25 mm minimum inlets, and 25 mm outlets. The discharge pipe from the relief valve shall be the size of the valve outlet.

### 2.3.3 Thermostatic Mixing Valves

Provide thermostatic mixing valve for lavatory faucets. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced shall be line size and shall be constructed with rough or finish bodies either with or without plating. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, corrosion-resisting steel or copper. The valve shall be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 2 degrees C of any setting.

## 2.4 FIXTURES

Water closet replacements in major renovations may have a flush valve of up to 6.1 LPF to accommodate existing plumbing capacity. Vitreous China, nonabsorbent, hard-burned, and vitrified throughout the body shall be provided. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Internal parts of flush valves and flushometer valves, shower mixing valves, shower head face plates, pop-up stoppers of lavatory waste drains, and pop-up stoppers and overflow tees and shoes of bathtub waste drains.

### 2.4.1 Lavatories

Vitreous china lavatories shall be provided with two integral molded lugs on the back-underside of the fixture and drilled for bolting to the wall in a manner similar to the hanger plate. Provide faucet with a maximum flow rate of 1.9 L/min at a flowing pressure of 414 kPa. Water volume must be limited to 1.0 L per metering cycle.

### 2.4.2 Flush Tank Water Closets

JIS A 5207 white vitreous china, siphon jet, round bowl, pressure assisted, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 360 to 380 mm, Gravity tank type water closets are not permitted. Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet shall not exceed 4.8 liters per flush.

### 2.4.3 Countertop Lavatories

JIS A 5207 white vitreous china,self-rimming, minimum dimensions of 480mm wide by 430 mm front to rear, with supply openings for use with top mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Provide aerator with faucet. Provide lavatory faucets and accessories meeting the flow rate and product requirements of the paragraph LAVATORIES.

### 2.4.4 Service Sinks

JIS A 5207, white vitreous china with integral back and wall hanger supports, minimum dimensions of 560 mm wide by 510 mm front to rear, with two supply openings in 254 mm high back. Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards as recommended by service sink manufacturer. Provide back mounted washerless service sink faucets with vacuum breaker and 19 mm external hose threads.

### 2.4.5 Bathtubs, Cast Iron

JIS A 5207 white enameled cast iron, recessed type, minimum dimensions of 1520 mm wide by 760 mm front to rear by 410 mm high with drain outlet for above-the-floor drain installation. Provide left or right drain outlet

bathtub as indicated.

## 2.5 BACKFLOW PREVENTERS

Backflow preventers with intermediate atmospheric vent shall conform to JIS S 3200-5. Reduced pressure principle backflow preventers shall be approved product of quality certification center of JWWA. Hose connection vacuum breakers shall be approved product of quality certification center of JWWA. Pipe applied atmospheric type vacuum breakers shall be approved product of quality certification center of JWWA. Pressure vacuum breaker assembly shall be approved product of quality certification center of JWWA. Air gaps in plumbing systems shall conform to Ministry of Health Labor and Welfare Ordinance Article 123.

## 2.6 DRAINS

### 2.6.1 Floor and Shower Drains

Floor and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to JCM 201.

### 2.6.2 Bathtub and Shower Faucets and Drain Fittings

Provide single control pressure equalizing bathtub and shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide tubing mounted from behind the wall between bathtub faucets and shower heads and bathtub diverter spouts. Provide separate globe valves or angle valves with union connections in each supply to faucet. Provide trip-lever pop-up drain fittings for above-the-floor drain installations. The top of drain pop-ups, drain outlets, tub overflow outlet, and; control handle for pop-up drain shall be chromium-plated or polished stainless steel. Linkage between drain pop-up and pop-up control handle at bathtub overflow outlet shall be copper alloy or stainless steel. Provide 40 mm copper alloy adjustable tubing with slip nuts and gaskets between bathtub overflow and drain outlet; chromium-plated finish is not required. Provide bathtub and shower valve with ball type control handle.

### 2.6.3 Floor Sinks

Floor sinks shall be circular, with 300 mm nominal overall width or diameter and 250 mm nominal overall depth. Floor sink shall have an acid-resistant enamel interior finish with cast-iron body, sediment bucket, and perforated grate of cast iron in industrial areas and stainless steel in finished areas. The outlet pipe size shall be as indicated or of the same size as the connecting pipe.

## 2.7 TRAPS

Unless otherwise specified, traps shall be copper-alloy adjustable tube type with slip joint inlet and swivel. Traps shall be without a cleanout. Provide traps with removable access panels for easy clean-out at sinks and lavatories. Tubes shall be copper alloy with walls not less than 0.813 mm thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall have internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 50 mm. The interior diameter shall be not more than 3.2 mm over or under the nominal size, and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

## 2.8 WATER HEATERS

Water heater types and capacities shall be as indicated. Each water heater shall have replaceable anodes. Each primary water heater shall have controls with an adjustable range that includes 32 to 71 degrees C.

### 2.8.1 Automatic Storage Type

#### 2.8.1.1 Electric Type

Electric type water heaters shall conform to JIS C 9219-1 with dual heating elements. Each element shall be 4.5 KW. The elements shall be wired so that only one element can operate at a time.

## 2.9 PUMPS

### 2.9.1 Sump Pumps

Sump pumps shall be of capacities indicated. The pumps shall be of the automatic, electric motor-driven, submerged type, complete with necessary control equipment and with a split or solid cast-iron or steel cover plate. The pumps shall be direct-connected by an approved flexible coupling to a vertical electric motor having a continuous oiling device or packed bearings sealed against dirt and moisture. Motors shall be totally enclosed, fan-cooled of sizes as indicated. The across-the-line magnetic controller shall be equipped with industrial use type enclosure. Integral size motors shall be the premium efficiency type in accordance with JIS C 4212. Each pump shall be fitted with a high-grade thrust bearing mounted above the floor. Each shaft shall have an alignment bearing at each end, and the suction inlet shall be between 75 and 150 mm above the sump bottom. The suction side of each pump shall have a strainer of ample capacity. A float switch assembly, with the switch completely enclosed in an industrial use type enclosure, shall start and stop each motor at predetermined water levels. Duplex pumps shall be equipped with an automatic alternator to change the lead operation from one pump to the other, and for starting the second pump if the flow exceeds the capacity of the first pump. The discharge line from each pump shall be provided

with a union or flange, a nonclog swing check valve, and a stop valve in an accessible location near the pump.

### 2.9.2 Lift Pumps

#### 2.9.2.1 Centrifugal Pumps

Horizontal split-case centrifugal-type booster pumps shall be furnished. The capacities shall be as shown, and the speed shall not exceed 1800 rpm. Pumps shall have a casing of close-grained iron or steel with smooth water passages. A gasket shall be provided between the upper and lower halves of the casing. Suction and discharge connections shall be flanged. Impellers shall be nonoverloading, bronze, balanced to eliminate vibration, and shall be keyed to corrosion-resisting steel shafts. The casings shall be fitted with bronze wearing or sealing rings. Bearings shall be cartridge type, enabling the entire rotating element to be removed without disturbing alignment or exposing the bearings to dirt, water, and other foreign matter. Pumps shall be provided with mechanical seals. Seal boxes shall be machined in the pump casing and at both sides of the pump, and shall be of sufficient depth to include a conventional bronze seal ring and rows of shaft packing. Bedplates shall be close-grain cast iron or steel with ribs and lugs, complete with foundation bolts, and shall have a drip lip with drain hole. Each pump shall be tested at the manufacturer's plant for operating characteristics at the rated capacity and under specified operating conditions. Test curves shall be furnished showing capacity in liters per second, head in meters, efficiency, brake wattage, and operation in parallel with similar pumps. Multiple pump installations shall have pump characteristics compatible for operation in parallel with similar pumps. The electric motor shall be sized for non-overload when operating at any point along the characteristic curve of the pump. Guards shall shield exposed belts and moving parts.

#### 2.9.2.2 Controls

Each pump motor shall be provided with enclosed across-the-line-type magnetic controller complete in an industrial use type enclosure with three position, "HAND-OFF-AUTOMATIC," selector switch in cover. Pumps shall be automatically started and stopped by float or pressure switches, as indicated. The pumps shall start and stop at the levels and pressures indicated. A multiposition sequence selector switch shall be provided so that any two pumps may be operated simultaneously keeping a third pump as a standby.

### 2.9.3 Flexible Connectors

Flexible connectors shall be provided at the suction and discharge of each pump that is 1 hp or larger. Connectors shall be constructed of neoprene, rubber, or braided bronze, with Class 150 standard flanges. Flexible connectors shall be line size and suitable for the pressure and temperature of the intended service.

## 2.10 DOMESTIC WATER STORAGE TANKS

Modular water tank for domestic water storage up to 40°C consisting of insulated panels made from glass fiber reinforced polyester (GRP), also sometimes referred to as fiberglass reinforced polymer (FRP). Gasket sealed manhole panel having an opening of 600 mm in its center. Manhole opening shall raise 100 mm from the roof panel surface to prevent water

and other contaminants from entering the tank. Gaskets shall meet NSF/ANSI 61 requirements. Corrosion-resistant galvanized steel or SUS304 stainless steel assembly bolts. ABS air vents with insect screen and PVC electrode seats and covers. Internal ladder of PVC-U and external ladder of hot-dip galvanized steel. The frame shall meet hot-dip galvanized specification. Tank shall conform to water supply laws, food sanitation laws, and algae growth prevention technical guidelines. The foundation shall be continuous with a level surface and have adequate strength.

## 2.11 DOMESTIC WATER SERVICE METER

The requirements for metering and submetering are specified in Section 33 11 00 WATER UTILITY DISTRIBUTION PIPING.

Cold water meters 50 mm and smaller shall be positive displacement type conforming to JIS B 8570-1. Cold water meters 64 mm and larger shall be turbine type conforming to JIS B 8570-1. Meter register may be round or straight reading type, as provided by the local utility. Meter shall be provided with a pulse generator, remote readout register and all necessary wiring and accessories.

Meters must be connected to the base wide energy and utility monitoring and control system (if this system exists) using the installation's advanced metering protocols.

## 2.12 ELECTRICAL WORK

Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with JIS C 4212. In addition to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, provide polyphase, squirrel-cage medium induction motors with continuous ratings, including motors that are part of a system, that meet the efficiency ratings for premium efficiency motors in accordance with JIS C 4212. Provide motors in accordance with JIS C 4212 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

## 2.13 MISCELLANEOUS PIPING ITEMS

### 2.13.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

### 2.13.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Sleeves are not required where supply drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade, except where penetrating a membrane waterproof floor.

#### 2.13.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

#### 2.13.2.2 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

### 2.13.3 Pipe Hangers (Supports)

Provide Pipe hangers and supports in accordance with MLIT-M.

### 2.13.4 Nameplates

Provide 3.2 mm thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 6.4 mm high normal block lettering into the white core. Minimum size of nameplates shall be 25 by 63 mm. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

## PART 3 EXECUTION

## 3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to NFPA 90A. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA Fire Man. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended 1.5 m outside the building, unless otherwise indicated. A gate valve and drain shall be installed on the water service line inside the building approximately 150 mm above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 300 mm below the average local frost depth or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

### 3.1.1 Water Pipe, Fittings, and Connections

#### 3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied

with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 12 mm between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 100 mm and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 20 mm hose bibb with renewable seat and gate valve ahead of hose bibb. At other low points, 20 mm brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets and changes in direction where indicated and required. Risers shall be securely anchored as required or

where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 15 m in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

#### 3.1.1.7 Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 100 mm in diameter or larger shall be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 14 MPa after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of the thrust block shall be poured against undisturbed earth. The side of the thrust block not subject to thrust shall be poured against forms. The area of bearing will be as shown. Blocking shall be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

#### 3.1.1.8 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with products conforming to the Performance Standards Compliant Product (PSCP) of the Water Supply Law. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to JIS S 3200-3. Vertical capped pipe columns will not be permitted.

### 3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

#### 3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to JIS B 0203. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

#### 3.1.2.2 Mechanical Couplings

Mechanical couplings may be used in conjunction with grooved pipe for

aboveground, ferrous or non-ferrous, domestic hot and cold water systems, in lieu of unions, brazed, soldered, welded, flanged, or threaded joints.

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints shall incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe.

Designs which can only clamp on the bottom of the groove or which utilize gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

Grooved fittings and couplings, and grooving tools shall be provided from the same manufacturer. Segmentally welded elbows shall not be used. Grooves shall be prepared in accordance with the coupling manufacturer's latest published standards. Grooving shall be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations.

The Contracting Officer shall be notified 24 hours in advance of test to demonstrate operator's capability, and the test shall be performed at the work site, if practical, or at a site agreed upon. The operator shall demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 65 mm and smaller; flanges shall be used on pipe sizes 80 mm and larger.

3.1.2.4 Grooved Mechanical Joints

Grooves shall be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools shall be products of the same manufacturer. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations.

3.1.2.5 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.2.6 Copper Tube and Pipe

a. Brazed. Brazed joints shall be made in conformance with JIS Z 3621, JIS H 3300, and JIS H 3300 with flux and are acceptable for all pipe

sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.

b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 50 mm and smaller. Soldered joints shall conform to JIS H 3300 and JIS H 3300. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.

c. Copper Tube Extracted Joint. Mechanically extracted joints shall be made in accordance with MLIT-M.

d. Press connection. Copper press connections shall be made in **strict** accordance with the manufacturer's installation instructions for manufactured rated size. The joints shall be pressed using the tool(s) approved by the manufacturer **of that joint**. Minimum distance between fittings shall be in accordance with the manufacturer's requirements.

3.1.2.7 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe shall have joints made with solvent cement. PVC and CPVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.2.8 Glass Pipe

Joints for corrosive waste glass pipe and fittings shall be made with corrosion-resisting steel compression-type couplings with acrylonitrile rubber gaskets lined with polytetrafluoroethylene.

3.1.2.9 Corrosive Waste Plastic Pipe

Joints for polyolefin pipe and fittings shall be made by mechanical joint or electrical fusion coil method. Joints for filament-wound reinforced thermosetting resin pipe shall be made in accordance with manufacturer's instructions. Unions or flanges shall be used where required for disconnection and inspection.

3.1.2.10 Other Joint Methods

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

### 3.1.4 Corrosion Protection for Buried Pipe and Fittings

Ductile iron, cast iron, and steel pipe, fittings, and joints shall have a protective coating. Additionally, ductile iron, cast iron, and steel pressure pipe shall have a cathodic protection system and joint bonding. The pipe shall be cleaned and the coating system applied prior to pipe tightness testing. Joints and fittings shall be cleaned and the coating system applied after pipe tightness testing. For tape coating systems, the tape shall conform to JWWA K 115 and shall be applied with a 50 percent overlap. Primer utilized with tape type coating systems shall be as recommended by the tape manufacturer.

### 3.1.5 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

#### 3.1.5.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 100 mm above the finished floor.

Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 25 mm clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic.

Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to JIS A 5758 and with a primer, backstop material and surface preparation as specified in Section 07 92 00 JOINT

SEALANTS. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated.

Sleeves through below-grade walls in contact with earth shall be recessed 12 mm from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant. Pipe sleeves in fire-rated walls shall conform to the requirements in Section 07 84 00 FIRESTOPPING.

3.1.5.2 Flashing Requirements

Pipes passing through roof shall be installed through a 4.9 kg per square meter copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 200 mm from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 250 mm. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 200 mm from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 250 mm in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

3.1.5.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 40 mm to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 40 mm; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 200 mm from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 40 mm to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

3.1.5.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be

accomplished by utilizing the following:

a. A standard roof coupling for threaded pipe up to 150 mm in diameter.

b. A tack-welded or banded-metal rain shield around the pipe.

3.1.5.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs FLASHING REQUIREMENTS and WATERPROOFING, a groove 6 to 13 mm wide by 6 to 10 mm deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.1.5.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

3.1.6 Fire Seal

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided as specified in Section 07 84 00 FIRESTOPPING.

3.1.7 Supports

3.1.7.1 General

Hangers used to support piping 50 mm and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

3.1.7.2 Pipe Supports and Structural Bracing, Seismic Requirements

Piping and attached valves shall be supported and braced to resist seismic loads as specified in Section 23 05 48.19 SEISMIC BRACING FOR HVAC.

3.1.7.3 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MLIT-M except as modified herein.

a. Horizontal pipe supports shall be spaced as specified in MLIT-M and a support shall be installed not over 300 mm from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 1.5 m apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 49 degrees C for PVC and 82 degrees C for CPVC. Horizontal pipe runs shall include

allowances for expansion and contraction.

b. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 4.5 m nor more than 2 m from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.

3.1.7.4 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

3.1.8 Welded Installation

Plumbing pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to JIS B 8285. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.9 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 100 mm will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 100 mm. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 450 mm of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast

brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron or plastic.

## 3.2 WATER HEATERS

### 3.2.1 Relief Valves

No valves shall be installed between a relief valve and its water heater or storage tank. The P&T relief valve shall be installed where the valve actuator comes in contact with the hottest water in the heater. Whenever possible, the relief valve shall be installed directly in a tapping in the tank or heater; otherwise, the P&T valve shall be installed in the hot-water outlet piping. A vacuum relief valve shall be provided on the cold water supply line to the hot-water storage tank or water heater and mounted above and within 150 mm above the top of the tank or water heater.

### 3.2.2 Heat Traps

Piping to and from each water heater and hot water storage tank shall be routed horizontally and downward a minimum of 600 mm before turning in an upward direction.

### 3.2.3 Connections to Water Heaters

Connections of metallic pipe to water heaters shall be made with dielectric unions or flanges.

## 3.3 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified.

### 3.3.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

### 3.3.2 Height of Fixture Rims Above Floor

Lavatories shall be mounted with rim 775 mm above finished floor.

### 3.3.3 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

### 3.3.4 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

#### 3.3.4.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

#### 3.3.4.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

#### 3.3.4.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

### 3.3.5 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with MLIT-M at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

### 3.3.6 Access Panels

Access panels shall be provided for concealed valves and controls, or any

item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

## 3.4 VIBRATION-ABSORBING FEATURES

Mechanical equipment, including compressors and pumps, shall be isolated from the building structure by approved vibration-absorbing features, unless otherwise shown. Each foundation shall include an adequate number of standard isolation units. Each unit shall consist of machine and floor or foundation fastening, together with intermediate isolation material, and shall be a standard product with printed load rating. Piping connected to mechanical equipment shall be provided with flexible connectors.

## 3.5 IDENTIFICATION SYSTEMS

### 3.5.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 35 mm minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

### 3.5.2 Pipe Color Code Marking

Color code marking of piping shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

## 3.6 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

## 3.7 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS.

### 3.7.1 Painting of New Equipment

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

#### 3.7.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors

shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with JIS Z 2371 and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 3 mm on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 50 degrees C, the factory painting system shall be designed for the temperature service.

#### 3.7.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 50 degrees C shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

a. Temperatures Less Than 50 Degrees C: Immediately after cleaning, the metal surfaces subject to temperatures less than 50 degrees C shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.0076 mm, one coat of primer applied to a minimum dry film thickness of 0.0255 mm; and two coats of enamel applied to a minimum dry film thickness of 0.0255 mm per coat.

b. Temperatures Between 50 and 205 Degrees C: Metal surfaces subject to temperatures between 50 and 205 degrees C shall receive two coats of 205 degrees C heat-resisting enamel applied to a total minimum thickness of 0.05 mm.

c. Temperatures Greater Than 205 Degrees C: Metal surfaces subject to temperatures greater than 205 degrees C shall receive two coats of 315 degrees C heat-resisting paint applied to a total minimum dry film thickness of 0.05 mm.

## 3.8 TESTS, FLUSHING AND DISINFECTION

### 3.8.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance with MLIT-M, except that the drainage and vent system final test shall include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure and reasons for choosing this option in lieu of the smoke test to the Contracting Officer for approval.

a. Drainage and Vent Systems Test. The final test shall include a smoke test.

b. Building Sewers Tests.

c. Water Supply Systems Tests.

3.8.1.1 Test of Backflow Prevention Assemblies

Backflow prevention assembly shall be tested using gauges specifically designed for the testing of backflow prevention assemblies.

Backflow prevention assembly test gauges shall be tested annually for accuracy in accordance with the requirements of State or local regulatory agencies. If there is no State or local regulatory agency requirements, gauges shall be tested annually for accuracy in accordance with the requirements of University of Southern California's Foundation of Cross Connection Control and Hydraulic Research or the American Water Works Association Manual of Cross Connection (Manual M-14), or any other approved testing laboratory having equivalent capabilities for both laboratory and field evaluation of backflow prevention assembly test gauges. Report form for each assembly shall include, as a minimum, the following:

| | |
|---|---|
| Data on Device | Data on Testing Firm |
| Type of Assembly | Name |
| Manufacturer | Address |
| Model Number | Certified Tester |
| Serial Number | Certified Tester No. |
| Size | Date of Test |
| Location | |
| Test Pressure Readings | Serial Number and Test Data of Gauges |

If the unit fails to meet specified requirements, the unit shall be repaired and retested.

3.8.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

3.8.3 System Flushing

3.8.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 1.2 meters per second through all

portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by JIS S 3200-7, Section 9, shall be flushed a minimum of 1 L per 24 hour period, ten times over a 14 day period.

3.8.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Flow rates on fixtures must not exceed those stated in PART 2 of this Section. Unless more stringent local requirements exist, lead levels shall not exceed limits established by JIS S 3201. The water supply to the building shall be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

3.8.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

a. Time, date, and duration of test.

b. Water pressures at the most remote and the highest fixtures.

c. Operation of each fixture and fixture trim.

d. Operation of each valve, hydrant, and faucet.

e. Pump suction and discharge pressures.

f. Temperature of each domestic hot-water supply.

g. Operation of each floor and roof drain by flooding with water.

h. Operation of each vacuum breaker and backflow preventer.

### 3.8.5 Disinfection

After all system components are provided and operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. Before introducing disinfecting chlorination material, entire system shall be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure shall be in accordance with Japanese Water Supply Law, Article 20 as modified and supplemented by this specification. The chlorinating material shall be hypochlorites or liquid chlorine. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator and booster pump until the entire system is completely filled.

Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet shall be opened and closed several times.

After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.

Upon the specified verification, the system including tanks shall then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet shall be opened and closed several times.

Take additional samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer. Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with MLIT-M. The testing method used shall be EPA approved for drinking water systems and shall comply with applicable local and state requirements.

Disinfection shall be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

### 3.8.6 Drinking Water Testing Requirements

After all Flushing, Operational Test and Disinfection of the water lines has been completed, Contractor must conduct analysis and testing of the Drinking Water for Total Coliform, on site PH, and Residual Chlorine in accordance with Japanese standard, and submit the final results to SGBX.

Laboratory that conduct the analysis and testing of the Drinking Water,shall be water quality testing registration organization in Japan.

## 3.9 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

## 3.10 PERFORMANCE OF WATER HEATING EQUIPMENT

Standard rating condition terms are as follows:

EF = Energy factor, minimum overall efficiency.

ET = Minimum thermal efficiency with 21 degrees C delta T.

SL = Standby loss is maximum (Btu/h) based on a 38.9 degree C temperature difference between stored water and ambient requirements.

V = Rated volume in gallons

Q = Nameplate input rate in kW (Btu/h)

### 3.10.1 Storage Water Heaters

#### 3.10.1.1 Electric

a. Storage capacity of 227 liters shall have a minimum energy factor (EF) of 0.93 or higher per FEMP requirements.

b. Storage capacity of 227 liters or more shall have a minimum energy factor (EF) of 0.91 or higher per FEMP requirements.

## 3.11 TABLES

TABLE I

PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS

| Item # | Pipe and Fitting Materials | SERVICE A | SERVICE B | SERVICE C | SERVICE D | SERVICE E | SERVICE F | SERVICE G |
|---|---|---|---|---|---|---|---|---|
| 1 | Seamless copper pipe, JIS H 3300 | | | | | | X | X |

TABLE I

PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS

| Item # | Pipe and Fitting Materials | SERVICE A | SERVICE B | SERVICE C | SERVICE D | SERVICE E | SERVICE F | SERVICE G |
|---|---|---|---|---|---|---|---|---|
| 2 | Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, JIS K 6739 or JIS K 6741, | X | X | X | X | X | X | X |

SERVICE:

A - Underground Building Soil, Waste and Storm Drain
B - Aboveground Soil, Waste, Drain In Buildings
C - Underground Vent
D - Aboveground Vent
E - Interior Rainwater Conductors Aboveground
F - Corrosive Waste And Vent Above And Belowground
G - Condensate Drain Aboveground

* - Hard Temper

TABLE II

PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS

| Item # | Pipe and Fitting Materials | SERVICE A | SERVICE B | SERVICE C | SERVICE D |
|---|---|---|---|---|---|
| 1 | Seamless copper water tube, ASTM B88, ASTM B88M | X** | X** | X** | X*** |
| 2 | Chlorinated polyvinyl chloride (CPVC) plastic hot and cold water distribution system, ASTM D2846/D2846M | X | X | | X |
| 3 | Crosslinked Polyethylene (PEX) Plastic Pipe ASTM F877 | X | X | | X |

| TABLE II | | | | | |
|---|---|---|---|---|---|
| PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS | | | | | |
| Item # | Pipe and Fitting Materials | SERVICE A | SERVICE B | SERVICE C | SERVICE D |
| | SERVICE:<br>A - Cold Water Service Aboveground<br>B - Hot and Cold Water Distribution 82 degrees C Maximum Aboveground<br>C - Compressed Air Lubricated<br>D - Cold Water Service Belowground<br>Indicated types are minimum wall thicknesses.<br>** - Type L - Hard<br>*** - Type K - Hard temper with brazed joints only or type K-soft temper without joints in or under floors<br>**** - In or under slab floors only brazed joints | | | | |

-- End of Section --

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SECTION 23 05 48.19

SEISMIC BRACING FOR HVAC

**05/18, CHG 2: 08/20**

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SECTION 23 05 48.19

SEISMIC BRACING FOR HVAC
**05/18, CHG 2: 08/20**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

| | |
|---|---|
| ACI 355.2 | (2007) Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary |
| ACI 355.4 | (2011) Qualification of Post-Installed Adhesive Anchors in Concrete (ACI 355.4) and Commentary |

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

| | |
|---|---|
| AISC 325 | (2017) Steel Construction Manual |

AMERICAN WATER WORKS ASSOCIATION (AWWA)

| | |
|---|---|
| AWWA C105/A21.5 | (2018) Polyethylene Encasement for Ductile-Iron Pipe Systems |
| AWWA C116/A21.16 | (2015) Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray Iron Fittings |
| AWWA C153/A21.53 | (2019) Ductile-Iron Compact Fittings for Water Service |
| AWWA C213 | (2015) Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A36/A36M | (2019) Standard Specification for Carbon Structural Steel |
| ASTM A53/A53M | (2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM A153/A153M | (2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware |

| | |
|---|---|
| ASTM A325 | (2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength |
| ASTM A490 | (2014a) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength |
| ASTM A500/A500M | (2021) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes |
| ASTM A536 | (1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings |
| ASTM A563 | (2015) Standard Specification for Carbon and Alloy Steel Nuts |
| ASTM A603 | (2019) Standard Specification for Zinc-Coated Steel Structural Wire Rope |
| ASTM D1785 | (2015; E 2018) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120 |
| ASTM D2665 | (2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings |
| ASTM E488/E488M | (2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements |
| ASTM F891 | (2016) Standard Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core |
| ASTM F1554 | (2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength |

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

| | |
|---|---|
| FEMA P-414 | (January 2004) Installing Seismic Restraints for Duct and Pipe |

ICC EVALUATION SERVICE, INC. (ICC-ES)

| | |
|---|---|
| ICC ES AC193 | (2012) Acceptance Criteria for Mechanical Anchors in Concrete Elements |

JAPANESE STANDARDS ASSOCIATION (JSA)

| | |
|---|---|
| JIS B 1186 | (2013) Sets of High Strength Hexagon Bolt, Hexagon Nut and Plain Washers for Friction Grip Joints |
| JIS G 3101 | (2020) Rolled Steels for General Structure |

| | |
|---|---|
| JIS G 3106 | (2020) Rolled Steels for Welded Structure |
| JIS G 3114 | (2022) Hot-Rolled Atmospheric Corrosion Resisting Steels for Welded Structure |
| JIS G 3136 | (2022) Rolled Steels for Building Structure |
| JIS G 3444 | (2021) Carbon Steel Tubes for General Structure |
| JIS G 3466 | (2021) Carbon Steel Square and Rectangular Tubes for General Structure |
| JIS G 3475 | (2021) Carbon Steel Tubes for Building Structure |

METAL FRAMING MANUFACTURERS ASSOCIATION (MFMA)

| | |
|---|---|
| MFMA-4 | (2004) Metal Framing Standards Publication |

NSF INTERNATIONAL (NSF)

| | |
|---|---|
| NSF/ANSI 61 | (2020) Drinking Water System Components - Health Effects |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

| | |
|---|---|
| SMACNA 1981 | (2008) Seismic Restraint Manual Guidelines for Mechanical Systems, 3rd Edition |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| UFC 3-301-01 | (2019) Structural Engineering |
| UFC 3-301-02 | (2020) Design of Risk Category V Structures, National Strategic Military Assets |
| UFC 4-010-01 | (2018;with Change 1, 2020) DoD Minimum Antiterrorism Standards for Buildings |

VIBRATION ISOLATION AND SEISMIC CONTROL MANUFACTURERS ASSOCIATION (VISCMA)

| | |
|---|---|
| VISCMA 412 | (2014) Installing Seismic Restraints for Mechanical Equipment |

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 General Requirements

Apply the requirements for seismic protection measures described in this section and on the drawings to the mechanical equipment and mechanical systems both inside and outside of the building along with exterior utilities and systems listed below. Where there is a conflict between the specifications and the drawings, the specifications will take precedence. Accomplish resistance to lateral forces induced by earthquakes without consideration of friction resulting from gravity loads.

Mechanical Equipment Bracing for Antiterrorism (AT) Standards: In a separate load scenario from seismic load cases, all new overhead mechanical equipment having its weight (W) more than 14 kg shall have its mounting designed to resist the force of 0.5×W along horizontal direction and 1.5×Win the downward direction. Loads identified herein shall be considered strength level (i.e., factored) loads. Overhead items weighing less than 14 kg, floor-mounted items, and wall-mounted items not overhead, do not require AT bracing. Distributed mechanical systems such as ducts do not require AT bracing. This requirement shall be deemed to satisfy Standard 19 - Equipment Bracing per UFC 4-010-01.

1.2.2 Mechanical Equipment

Mechanical equipment to be seismically protected must include the following items to the extent required on the drawings or in other sections of these specifications:

Equipment/Components with Ip = 1.0

| | |
|---|---|
| Water Heaters | Storage Tanks for Water |
| Instrumentation and Control for HVAC | Exhaust Fan |
| Unitary DOAS Systems | Valves and Fittings for Piping |
| Pumps with Motors | Split System DX Units |

1.2.3 Mechanical Systems

Mechanical systems to be seismically protected must include the following items to the extent required on the drawings or in this or other sections of these specifications:

Mechanical systems with Ip = 1.0

a. All Piping and Ducts Inside the Building Except as Specifically Stated Below Under "Items Not Covered By This Section".

b. Condenser Water and Refrigerant Piping Outside the Building.

c. Water Storage Tanks Outside of Buildings.

d.Ductwork Outside of Buildings.

1.2.4 Contractor Designed Bracing

Submit copies of the manufacturer's standard with the drawings. The equipment shall be installed in accordance with seismic requirement of manufacturer's standard. Submit copies of the design calculations with the drawings. Calculations must be approved, certified, stamped and signed by a registered Professional Structural Engineer.A non-US citizen may qualify with a 1 Kyu Kenchikushi (First Class Qualified Architect) in lieu of U.S. licensing qualifications. Calculations must verify the capability of structural members to which bracing is attached for carrying the load from the brace. Design the bracing in accordance with UFC 3-301-01,

UFC 3-301-02, UFC 4-010-01 and additional data furnished by the Contracting Officer. Resistance to lateral forces induced by earthquakes must be accomplished without consideration of friction resulting from gravity loads. UFC 3-301-01 uses parameters for the building, not for the equipment in the building; therefore, corresponding adjustments to the formulas must be required. Loadings determined using UFC 3-301-01 are based on strength design; therefore, AISC 325 Specifications must be used for the design. The bracing for the mechanical equipment designated in paragraph 1.2.2 and systems designated in paragraph 1.2.3 must be developed by the Contractor.

Provide documentation of an independent design review for mission critical (MC) equipment bracing design. Documentation must be signed by the independent reviewer who must also be a registered structural engineer.

### 1.2.5 Items Not Covered By This Section

#### 1.2.5.1 Fire Protection Systems

Install seismic protection of piping for fire protection systems as specified in Division 21 of this specifications.

#### 1.2.5.2 Items Requiring No Seismic Restraints

Seismic restraints are not required for the following items:

a. Gas piping less than 25 mm nominal pipe size.

b. Piping in mechanical equipment rooms less than 32 mm nominal pipe size.

c. All other piping equal to or less than 80mm nominal pipe size.

d. Rectangular air handling ducts less than 0.56 square meters in cross sectional area.

e. Round air handling ducts less than 711 mm in diameter.

f. Piping suspended by individual hangers 300 mm or less in length from the top of pipe to the bottom of the supporting structural member where the hanger is attached, except as noted below.

g. Ducts suspended by hangers 300 mm or less in length from the top of the duct to the bottom of the supporting structural member, except as noted below.

In exemptions f. and g. all hangers must meet the length requirements. If the length requirement is exceeded by one hanger in the run, brace the entire run. Seismically protect interior piping and ducts not listed above in accordance with the provisions of this specification.

Non-critical items may require seismic restraints if adjacent to critical equipment or systems that must remain operational after an earthquake and could be compromised by impact with non-critical adjacent components.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" classification are for

information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Coupling and Bracing

Flexible Couplings or Joints

Equipment Restraint

Contractor Designed Bracing; G

SD-03 Product Data

Coupling and Bracing; G

Flexible Couplings Or Joints; G

Equipment Restraint; G

Contractor Designed Bracing; G

Snubbers

Anchor Bolts

Vibration Isolators

SD-05 Design Data

Design Calculations

SD-06 Test Reports

Anchor Bolts; G

# PART 2 PRODUCTS

## 2.1 GENERAL DESIGN REQUIREMENTS

Submit detailed seismic restraint drawings for mechanical equipment, duct systems, piping systems and any other mechanical systems along with calculations, catalog cuts, templates, and erection and installation details, as appropriate, for the items listed below. Indicate thickness, type, grade, class of metal, and dimensions; and show construction details, reinforcement, anchorage, and installation with relation to the building construction. Calculations must be stamped, by a registered structural engineer, and verify the capability of structural members to which bracing is attached for carrying the load from the brace. Include drawing for Mission Critical Equipment indicating the equipment location in the facility sufficient to be used for the installation. Design must be based on actual equipment and system layout. Design must include calculated dead loads, static seismic loads and capacity of materials utilized for the connection of the equipment or system to the structure. Analysis must detail anchoring methods.

## 2.2 EQUIPMENT RESTRAINT

Equipment must be rigidly or flexibly mounted as indicated in the specifications and/or drawings depending on vibration isolation requirements of manufacturer. DOAS AHU Units, Water Tank and Exhaust Fans, both vibration isolated and nonisolated, must have support members designed and anchored to building structural steel or concrete as required for seismic restraint and wind loads.

### 2.2.1 Rigidly (Base and Suspended) Mounted Equipment

HVAC equipment furnished under this contract must be installed in accordance with manufacturer's standard requirementRigidly mounted using cast-in-place anchor bolts or post-installed anchors that are qualified for earthquake loading in accordance with ACI 355.2 and ACI 355.4. Anchor bolts must conform to ASTM F1554 or JIS B 1186. For any rigid equipment which is rigidly anchored, provide flexible joints for piping, ductwork, electrical conduit, etc., that are capable of accommodating displacements equal to the full width of the joint in both orthogonal directions. Suspended equipment bracing attachments should be located just above the center of gravity to minimize swinging. Use the ratio of the overturning moment from seismic forces to the resisting moment due to gravity loads to determine if overturning forces need to be considered in the sizing of anchor bolts. Provide calculations to verify the adequacy of the anchor bolts for combined shear and overturning.

Roof mounted HVAC equipment roof curbs, framing and attachment to equipment and structure must be designed and braced to withstand seismic loads.

### 2.2.2 Nonrigid or Flexibly-Mounted Equipment

Select vibration isolation devices of manufacturer's standard,so that the maximum movement of equipment from the static deflection point is 6 mm. Equipment flexibly mounted on vibration isolators must have a bumper restraint or snubber in each horizontal direction and vertical restraints must be provided where required to resist overturning. Isolator housing and restraints must be constructed of ductile materials. A viscoelastic pad or similar material of appropriate thickness must be used between the bumper and components to limit the impact load. Restraints must be designed to resist the calculated horizontal lateral and vertical forces.

Spring vibration isolators must be seismically rated, restrained isolators for equipment subject to load variations and large external forces. The seismically rated housing must be sized to meet or exceed the force requirements applicable to the project and meet the required isolation criteria.

## 2.3 BOLTS AND NUTS

Hex head bolts, and heavy hexagon nuts must be ASTM A325 or JIS B 1186, or ASTM A490 or JIS B 1186 bolts and ASTM A563 or JIS B 1186 nuts. Provide bolts and nuts galvanized in accordance with ASTM A153/A153M when used underground or exposed to weather.

## 2.4 FLEXIBLE JOINTS

Flexible joints must have same pressure and temperature ratings as adjoining pipe. Braided hoses must not be used where there is torsional

or axial movement unless manufacturer allows it.

2.4.1 Braided Hose Expansion Joint

Braided hose expansion joint(s) must be installed in the locations indicated on the drawings and as required to accommodate any thermal expansion, contraction or seismic movement of the piping system. Joints must consist of two parallel sections of corrugated metal hose, compatible braid, and 180 degree return bend with inlet and outlet connections. Field fabricated loops are not acceptable. Braided hose expansion joint(s) must be installed in the locations indicated on the drawings and as required to accommodate any thermal expansion, contraction or seismic movement of the piping system. Joints must consist of two parallel sections of corrugated metal hose, compatible braid, and 180 degree return bend with inlet and outlet connections. Field fabricated loops must not be acceptable. Braided hose in a 60 degree flexible V loop arrangement must be used for small diameter pipe connections to coils in variable-air-volume (VAV)terminal units and fan coil units installed in suspended ductwork whether braced or unbraced.

All braided hose expansion joints must be manufactured in accordance with the documented manufacturers weld procedure specifications. The procedure qualification record must be used to document the execution of this procedure and must follow the general "guidelines" of ASME Section IX. Each individual welder must conform to the in-house procedure qualification record and be qualified prior to each production lot. The testing of each individual welder must be documented in a welding procedure qualification record.

2.4.1.1 Corrugated Hose

Corrugated hose must be Type 304 stainless steel. Braid must be Type 304 stainless steel for any series 300 stainless steel hose. Fittings materials of construction and end fitting type must be consistent with pipe material and equipment/ pipe connection fittings. Copper fittings must not be attached to stainless steel hose.

2.4.1.2 Flexible Hose Expansion Loops

Flexible hose expansion loops must have a factory supplied, hanger / support lug located at the bottom of the 180deg return. Flexible hose expansion loop(s) must be furnished with a plugged FPT to be used for a drain or air release vent. Flexible hose expansion loop(s) must be rated with an operating pressure which is the same as the adjoining pipe. The operating pressure must be based on burst pressure with a 4 to 1 safety factor.

2.4.2 Double Ball Flexible Expansion Joint

Install flexible expansion joints manufactured of ductile iron conforming to the material requirements of ASTM A536 and AWWA C153/A21.53 in the locations indicated on the drawings. Provide foundry certification of material upon request. Each flexible expansion joint must be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 2 inch and 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, must apply. Factory Mutual Approval for the 3 inch through 12 inch sizes is required. Each flexible expansion joint must consist of an expansion joint designed and cast as an integral part of a

ball and socket type flexible joint, having a minimum per ball deflection of: 20°, 2" - 12"; 15°, 14" - 36"; 12°, 42"-48" and 4-inches minimum expansion. Additional expansion sleeves must be available and easily added or removed at the factory or in the field. Both standardized mechanical joint and flange end connections must be available.

2.4.2.1 Internal Surfaces

Line all internal surfaces (wetted parts) with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C213. Sealing gaskets must be constructed of EPDM. The coating must meet NSF/ANSI 61.

2.4.2.2 Exterior Surfaces

Coat exterior surfaces with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C116/A21.16. Include appropriately sized polyethylene sleeves, meeting AWWA C105/A21.5, for direct buried applications.

2.4.3 Double Ball Flexible Expansion Joint Gravity Drain (Non-Pressurized)

Flexible expansion joints gravity drain must be installed in the locations indicated on the drawings and must be manufactured of pvc. All connections whether solvent weld or mechanical must be restrained to allow movement to be transferred to expansion joint. Each ball must allow up to 15 degrees deflection.

End connection outside diameters must be compatible with ASTM D1785, ASTM D2665 and ASTM F891 PVC pipe and are to be solvent welded.

2.5 SWAY BRACING MATERIALS

Material used for members listed in this section and on the drawings, must be structural steel conforming with the following:

a. Plates, rods, and rolled shapes, ASTM A36/A36M or JIS G 3101, JIS G 3106, JIS G 3114, JIS G 3136.

b. Wire rope, ASTM A603 pre-stretched. Class B galv coating Ferrule clamps must be qualified by testing for use in seismic applications per VISCMA 412. A minimum of two clamps are required on each end of wire rope.

c. Tubes, ASTM A500/A500M, Grade B. or JIS G 3444, JIS G 3475

d. Pipes, ASTM A53/A53M, Grade B or JIS G 3444, JIS G 3466.

e. Angles, ASTM A36/A36M or JIS G 3101, JIS G 3106, JIS G 3114, JIS G 3136.

f. Channels (Struts) with in-turned lips and associated hardware for fastening to channels at random points conforming to MFMA-4

2.6 MULTIDIRECTIONAL SEISMIC SNUBBERS

Install multidirectional seismic snubbers employing elastomeric pads on floor- or slab-mounted equipment and large piping as detailed on drawings. These snubbers must provide 6 mm free vertical and horizontal movement from the static deflection point. Snubber medium must consist of multiple

pads of cotton duct and neoprene or other suitable materials arranged around a flanged steel trunnion so both horizontal and vertical forces are resisted by the snubber medium.

# PART 3 EXECUTION

## 3.1 COUPLING AND BRACING

a. Submit detail drawings, as specified here and throughout this specification, along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals must be complete in detail; must indicate thickness, type, grade, class of metal, and dimensions; and must show construction details, reinforcement, anchorage, and installation with relation to the building construction.

b. Provide coupling installation conforming to the details shown on the drawings. Provisions of this paragraph apply to all piping within a 1.5 m line around outside of building unless buried in the ground. Piping grouped for support on trapeze-type hangers must be braced at the most frequent interval as determined by applying the requirements of this specification to each piping run on the common support.

c. Size bracing components as required for the total load carried by the common supports. Bracing rigidly attached to pipe flanges, or similar, must not be used where it would interfere with thermal expansion of piping.

d. Adjust isolators and restraints after piping systems has been filled and equipment is at its operating weight, following the manufacturer's written instructions.

e. Install cables at a 45-degree slope. Where interference is present, the slope may be minimum of 30 degrees or a maximum of 60 degrees per VISCMA 412.

## 3.2 BUILDING DRIFT

Provide joints capable of accommodating seismic displacements for vertical piping between floors of the building, where pipes pass through a building seismic or expansion joint, or where rigidly supported pipes connect to equipment with vibration isolators. Provide horizontal piping across expansion joints to accommodate the resultant of the drifts of each building unit in each orthogonal direction. For threaded piping, provide swing joints made of the same piping material. For piping with manufactured ball joints the seismic drift must be 0.015 meters per meter of height above the base where the seismic separation occurs; this drift value must be used in place of the expansion given in the manufacturer's selection table.

## 3.3 FLEXIBLE COUPLINGS OR JOINTS

### 3.3.1 Building Piping

Provide flexible couplings or joints in building piping at bottom of all pipe risers for pipe larger than 90 mm in diameter. Laterally brace flexible couplings or joints without interfering with the action of the flexible coupling or joint. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used. Flexible bell

and spigot pipe joints using rubber gaskets may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to satisfy these requirements.

### 3.3.2 Underground Piping

Install flexible coupling in underground piping and 100 mm or larger conduit, except heat distribution system, where the piping enters the building. Provide couplings that accommodate 76 mm of relative movement between the pipe and the building in any direction. Provide additional flexible couplings where shown on the drawings.

## 3.4 PIPE SLEEVES

Size pipe sleeves in interior non-fire rated walls as indicated on the drawings to provide clearances that will permit differential movement of piping without the piping striking the pipe sleeve. Pipe sleeves in fire rated walls must conform to the requirements in Section 07 84 00 FIRESTOPPING.

## 3.5 SPREADERS

Provide spreaders between adjacent piping runs to prevent contact during seismic activity whenever pipe or insulated pipe surfaces are less than 100 mm apart. Apply spreaders at same interval as sway braces at an equal distance between the sway braces. If rack type hangers are used where the pipes are restrained from contact by mounting to the rack, spreaders are not required for pipes mounted in the rack. Apply spreaders to surface of bare pipe and over insulation on insulated pipes utilizing high-density inserts and pipe protection shields in accordance with the requirements of Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

## 3.6 SWAY BRACES FOR PIPING

Provide sway braces to prevent movement of the pipes under seismic loading. Provide braces in both the longitudinal and transverse directions, relative to the axis of the pipe. Provide sufficient braces for equipment to resist a horizontal force as specified in UFC 3-301-01 without exceeding safe working stress of bracing components. Provide bracing that does not interfere with thermal expansion requirements for the pipes as described in other sections of these specifications. For seismic analysis of horizontal pipes, the equivalent static force should be considered to act concurrently with the full dead load of the pipe, including contents.

### 3.6.1 Transverse Sway Bracing

Provide transverse sway bracing for steel and copper pipe at intervals not to exceed those shown on the drawings. All runs (length of pipe between end joints) must have a minimum of transverse bracing at each end. Provide transverse sway bracing for pipes of materials other than steel and copper at intervals not to exceed the hanger spacing as specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE.

### 3.6.2 Longitudinal Sway Bracing

Provide longitudinal sway bracing at 12 m intervals unless otherwise indicated. All runs (length of pipe between end joints) must have one longitudinal brace minimum. Construct sway braces in accordance with the

drawings. Do not use branch lines, walls, or floors as sway braces.

### 3.6.3 Vertical Runs

Run is defined as length of pipe between end joints. Do not brace vertical runs of piping no more than 3 m vertical intervals. Braces for vertical runs must be above the center of gravity of the segment being braced. Flexible couplings should be provided at the bottoms of risers for pipes larger than 3.5 in. (89 mm) in diameter. Flexible couplings and expansion joints should be braced laterally and longitudinally unless such bracing would interfere with the action of the couplings or joints. When pipes enter buildings, flexible couplings should be provided to allow for relative movement between the soil and building. Construct all sway braces in accordance with the drawings. Attach sway braces to the structural system. Do not connect to branch lines, walls, or floors.

### 3.6.4 Clamps and Hangers

Apply clamps or hangers on uninsulated pipes directly to pipe. Insulated piping must have clamps or hangers applied over insulation in accordance with Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

Hanger rod stiffener angle or strut bracing must be securely attached by a series of attachment clamps manufactured from a one piece metal stamping and must include all require attachment hardware and locking nuts. Attachment clamps made from aluminum or cast iron must not be used in seismic applications. Do not weld vertical braces to hanger rods.

## 3.7 SWAY BRACES FOR DUCTS

### 3.7.1 Braced Ducts

Provide bracing details and spacing for rectangular and round ducts in accordance with SMACNA 1981. However, the design seismic loadings for these items must not be less than loadings obtained using the procedures in UFC 3-301-01. Bracing must not attach to duct joints. Use shortest screws possible when penetrating ductwork to minimize airflow noise inside duct.

### 3.7.2 Unbraced Ducts

Attach hangers for unbraced ducts to the duct within 50 mm of the top of the duct with a minimum of two #10 sheet metal screws in accordance with FEMA P-414. Use shortest screws possible when penetrating ductwork to minimize airflow noise inside duct. Install unbraced ducts with a 150 mm minimum clearance to vertical ceiling hanger wires.

## 3.8 EQUIPMENT

### 3.8.1 General

Equipment shall be installed in accordance with manufacturer's standard. The contractor shall submit manufacturer's data of installation requirement and installation report.

Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices allowing adequate edge distance and embedment depth for restraint anchor bolts. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not drill

holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength. Install neoprene grommet washers or till the gap with epoxy on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 0.125 inches.

## 3.9 ANCHOR BOLTS

### 3.9.1 Cast-in-Place Anchor Bolts

Use templates to locate cast-in-place bolts accurately and securely in formwork. Anchor bolts must have an embedded straight length equal to at least 12 times nominal diameter of the bolt. Anchor bolts that exceed the normal depth of equipment foundation piers or pads must either extend into concrete floor or the foundation or be increased in depth to accommodate bolt lengths.

### 3.9.2 Drilled-In Anchor Bolts

Drill holes with rotary impact hammer drills Drill bits must be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes must be drilled perpendicular to the concrete surface. Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the COR if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines. Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength. Perform anchor installation in accordance with manufacturer instructions.

#### 3.9.2.1 Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors

Protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque must be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor must be removed and replaced unless otherwise directed by the Engineer.

#### 3.9.2.2 Cartridge Injection Adhesive Anchors

Where approved for seismic application, clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive must be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

#### 3.9.2.3 Capsule Anchors

Where approved for seismic application, perform drilling and setting operations in accordance with manufacturer instructions. Clean all holes to remove loose material and drilling dust prior to installation of adhesive. Remove water from drilled holes in such a manner as to achieve a surface dry condition. Capsule anchors must be installed with equipment conforming to manufacturer recommendations. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

## 3.10 ANCHOR BOLT TESTING

Test in place expansion and chemically bonded anchors not more than24 hours after installation of the anchor, conducted by an independent testing agency; testing must be performed on random anchor bolts as described below.

### 3.10.1 Torque Wrench Testing

Perform torque wrench testing on not less than 50 percent of the total installed applied torque expansion anchors and at least one anchor for every piece of equipment containing more than two anchors. The test torque must equal the minimum required installation torque as required by the bolt manufacturer. Calibrate torque wrenches at the beginning of each day the torque tests are performed. Recalibrate torque wrenches for each bolt diameter whenever tests are run on bolts of various diameters. Apply torque between 20 and 100 percent of wrench capacity. Reach the test torque within one half turn of the nut, except for 9 mm sleeve anchors which must reach their torque by one quarter turn of the nut. If any anchor fails the test, test similar anchors not previously tested until 20 consecutive anchors pass. Failed anchors must be retightened and retested to the specified torque; if the anchor still fails the test it must be replaced.

### 3.10.2 Pullout Testing

Test expansion and chemically bonded anchors by applying a pullout load using a hydraulic ram attached to the anchor bolt. Testing must be in accordance with ASTM E488/E488M or ICC ES AC193. At least 10 percent of each type and size of anchors, but not less than 3 per day must be tested. Apply the load to the anchor without removing the nut; when that is not possible, the nut must be removed and a threaded coupler must be installed of the same tightness as the original nut. Check the test setup to verify that the anchor is not restrained from withdrawing by the baseplate, the test fixture, or any other fixtures. The support for the testing apparatus must be at least 1.5 times the embedment length away from the bolt being tested. Load each tested anchor to 1 times the design tension value for the anchor. The anchor must have no observable movement at the test load. If any anchor fails the test, similar type and size anchors not previously tested must be tested until 10 percent of those type consecutive anchors pass. Remove and replace failed anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout.

-- End of Section --

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# SECTION 23 05 93

# TESTING, ADJUSTING, AND BALANCING FOR HVAC
**11/15**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

| | |
|---|---|
| ASA S1.4 | (1983; Amendment 1985; R 2006) Specification for Sound Level Meters (ASA 47) |
| ASA S1.11 PART 1 | (2014) American National Standard Electroacoustics – Octave-Band and Fractional-Octave-Band Filters – Part 1: Specifications |

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

| | |
|---|---|
| AMCA 203 | (1990; R 2011) Field Performance Measurements of Fan Systems |

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

| | |
|---|---|
| ASHRAE 62.1 | (2022; Addenda E-X 2022; Errata 1-2 2022; Errata 3 2023; Interpretation 1-3 2023) Ventilation for Acceptable Indoor Air Quality |
| ASHRAE HVAC APP SI HDBK | (2019) HVAC Applications Handbook, SI Edition |

ASSOCIATED AIR BALANCE COUNCIL (AABC)

| | |
|---|---|
| AABC MN-1 | (2002; 6th ed) National Standards for Total System Balance |
| AABC MN-4 | (1996) Test and Balance Procedures |

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

| | |
|---|---|
| NEBB MASV | (2006) Procedural Standards for Measurements and Assessment of Sound and Vibration |
| NEBB PROCEDURAL STANDARDS | (2015) Procedural Standards for TAB (Testing, Adjusting and Balancing) Environmental Systems |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

| | |
|---|---|
| SMACNA 1780 | (2002) HVAC Systems - Testing, Adjusting and Balancing, 3rd Edition |
| SMACNA 1858 | (2004) HVAC Sound And Vibration Manual - First Edition |
| SMACNA 1972 CD | (2012) HVAC Air Duct Leakage Test Manual - 2nd Edition |

## 1.2 DEFINITIONS

a. AABC: Associated Air Balance Council

b. COTR: Contracting Officer's Technical Representative

c. DALT: Duct air leakage test

d. DALT'd: Duct air leakage tested

e. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling

f. NEBB: National Environmental Balancing Bureau

g. Out-of-tolerance data: Pertains only to field acceptance testing of Final DALT or TAB report. When applied to DALT work, this phase means "a leakage rate measured during DALT field acceptance testing which exceeds the leakage rate allowed by SMACNA Leak Test Manual for an indicated duct construction and sealant class." When applied to TAB work this phase means "a measurement taken during TAB field acceptance testing which does not fall within the range of plus 5 to minus 5 percent of the original measurement reported on the TAB Report for a specific parameter."

h. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains within plus or minus 17.5 degrees Celsius of the project site's winter outdoor design temperature, throughout the period of TAB data recording.

i. Season of maximum cooling load: The time of year when the outdoor temperature at the project site remains within plus or minus 3 degrees Celsius of the project site's summer outdoor design temperature, throughout the period of TAB data recording.

j. Season 1, Season 2: Depending upon when the project HVAC is completed and ready for TAB, Season 1 is defined, thereby defining Season 2. Season 1 could be the season of maximum heating load, or the season of maximum cooling load.

k. Sound measurements terminology: Defined in AABC MN-1, NEBB MASV, or SMACNA 1858 (TABB).

l. TAB: Testing, adjusting, and balancing (of HVAC systems)

m. TAB'd: HVAC Testing/Adjusting/Balancing procedures performed

n. TAB Agency: TAB Firm

o. TAB team field leader: TAB team field leader

p. TAB team supervisor: TAB team engineer

q. TAB team technicians: TAB team assistants

r. TABB: Testing Adjusting and Balancing Bureau

### 1.2.1 Similar Terms

In some instances, terminology differs between the Contract and the TAB Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed herein to produce optimal results.

The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding AABC, NEBB, or TABB requirements where differences exist.

| SIMILAR TERMS | | | |
|---|---|---|---|
| Contract Term | AABC Term | NEBB Term | TABB Term |
| TAB Standard | National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems | Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems | International Standards for Environmental Systems Balance |
| TAB Specialist | TAB Engineer | TAB Supervisor | TAB Supervisor |
| Systems Readiness Check | Construction Phase Inspection | Field Readiness Check & Preliminary Field Procedures | Field Readiness Check & Prelim. Field Procedures |

## 1.3 WORK DESCRIPTION

The work includes duct air leakage testing (DALT) and testing, adjusting, and balancing (TAB) ofnew heating, ventilating, and cooling (HVAC) air distribution systems including equipment and performance data, ducts, which are located within, on, under, between, and adjacent to buildings

Perform TAB in accordance with the requirements of the TAB procedural standard recommended by the TAB trade association that approved the TAB Firm's qualifications. Comply with requirements of AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780 (TABB) as supplemented and modified by this specification section. All recommendations and suggested practices contained in the TAB procedural standards are considered mandatory.

Conduct DALT and TAB of the indicated systems and equipment and submit the specified DALT and TAB reports for approval. Conduct DALT testing in

compliance with the requirements specified in SMACNA 1972 CD, except as supplemented and modified by this section. Conduct DALT and TAB work in accordance with the requirements of this section.

1.3.1 Air Distribution Systems

Test, adjust, and balance systems(TAB) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.3.2 TAB SCHEMATIC DRAWINGS

Show the following information on TAB Schematic Drawings:

1. A unique number or mark for each piece of equipment or terminal.

2. Air quantities at air terminals.

3. Air quantities and temperatures in air handling unit schedules.

4. Water quantities and temperatures in thermal energy transfer equipment schedules.

5. Water quantities and heads in pump schedules.

6. Water flow measurement fittings and balancing fittings.

7. Ductwork Construction and Leakage Testing Table that defines the DALT test requirements, including each applicable HVAC duct system ID or mark, duct pressure class, duct seal class, and duct leakage test pressure. This table is included in the file for Graphics for Unified Facilities Guide Specifications: http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-gra

The Testing, Adjusting, and Balancing (TAB) Specialist must review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the effective and accurate TAB of the system, including records of existing conditions, and systems readiness check. The TAB Specialist must provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

Submit three copies of the TAB Schematic Drawings and Report Forms to the Contracting Officer, no later than 21 days prior to the start of TAB field measurements.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Records of Existing Conditions; G

TAB Firm; G

Designation of TAB Team Assistants; G

Designation of TAB Team Engineer; G or TAB Specialist; G

Designation of TAB Team Field Leader; G

SD-02 Shop Drawings

TAB Schematic Drawings and Report Forms; G

SD-03 Product Data

Equipment and Performance Data; G

TAB Related HVAC Submittals; G

A list of the TAB Related HVAC Submittals, no later than 7 days after the approval of the TAB team engineer and assistant.

TAB Procedures; G

Proposed procedures for TAB, submitted with the TAB Schematic Drawings and Report Forms.

Calibration; G

Systems Readiness Check; G

TAB Execution; G

TAB Verification; G

SD-06 Test Reports

Completed Pre-Final DALT Report; G

Certified Final DALT Report; G

TAB Design Review Report;

TAB Report for Season 1; G

TAB Report for Season 2; G

SD-07 Certificates

Independent TAB Agency and Personnel Qualifications; G

DALT and TAB Submittal and Work Schedule; G

TAB Pre-Field Engineering Report; G

TAB Firm; G

Design Review Report; G

Pre-field DALT Preliminary Notification; G

Advanced Notice for Season 1 TAB Field Work; G

Prerequisite HVAC Work Check Out List For Season 1; G

Advanced Notice for Season 2 TAB Field Work; G

Prerequisite HVAC Work Check Out List For Season 2; G

## 1.5 QUALITY ASSURANCE

### 1.5.1 Independent TAB Agency and Personnel Qualifications

To secure approval for the proposed agency, submit information certifying that the TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract, including design, furnishing equipment, or construction. Further, submit the following, for the agency, to Contracting Officer for approval:

a. Independent AABC or NEBB or TABB TAB agency:

TAB agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification; or TABB certification number and expiration date of current certification.

TAB team supervisor: Name and copy of AABC or NEBB or TABB TAB supervisor certificate and expiration date of current certification.

TAB team field leader: Name and documented evidence that the team field leader has satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.

TAB team field technicians: Names and documented evidence that each field technician has satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.

Current certificates: Registrations and certifications are current, and valid for the duration of this contract. Renew Certifications which expire prior to completion of the TAB work, in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification are not to perform TAB work on this contract.

b. TAB Team Members: TAB team approved to accomplish work on this contract are full-time employees of the TAB agency. No other personnel is allowed to do TAB work on this contract.

c. Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.

1.5.2 TAB Standard

Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780 unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard are considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practical, to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations.

All quality assurance provisions of the TAB Standard such as performance guarantees are part of this contract. For systems or system components not covered in the TAB Standard, TAB procedures must be developed by the TAB Specialist. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are considered mandatory, including the latest requirements of ASHRAE 62.1.

1.5.3 Qualifications

1.5.3.1 TAB Firm

The TAB Firm must be either a member of AABC or certified by the NEBB or the TABB and certified in all categories and functions where measurements or performance are specified on the plans and specifications, including TAB of environmental systemsthe performance of clean rooms and clean air devices building systems commissioningandthe measuring of sound and vibration in environmental systems.

Certification must be maintained for the entire duration of duties specified herein. If, for any reason, the firm loses subject certification during this period, the Contractor must immediately notify the Contracting Officer and submit another TAB Firm for approval. Any firm that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award is not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections to be performed by the TAB Firm will be considered invalid if the TAB Firm loses its certification prior to Contract completion and must be performed by an approved successor.

These TAB services are to assist the prime Contractor in performing the quality oversight for which it is responsible. The TAB Firm must be a prime subcontractor of the Contractor and be financially and corporately independent of the mechanical subcontractor, reporting directly to and paid by the Contractor.

1.5.3.2 TAB Specialist

The TAB Specialist must be either a member of AABC,an experienced technician of the Firm certified by the NEBB, or a Supervisor certified by the TABB. The certification must be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject

certification during this period, immediately notify the Contracting Officer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award is not eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the TAB Specialist will be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by the approved successor.

1.5.3.3 TAB Specialist Responsibilities

TAB Specialist responsibilities include all TAB work specified herein and in related sections under his direct guidance. The TAB specialist is required to be onsite on a daily basis to direct TAB efforts. The TAB Specialist must participate in the commissioning process specified in Section 01 91 00.15 BUILDING COMMISSIONING.

1.5.3.4 TAB Related HVAC Submittals

The TAB Specialist must prepare a list of the submittals from the Contract Submittal Register that relate to the successful accomplishment of all HVAC TAB. Accompany the submittals identified on this list with a letter of approval signed and dated by the TAB Specialist when submitted to the Government. Ensure that the location and details of ports, terminals, connections, etc., necessary to perform TAB are identified on the submittals.

1.5.4 Responsibilities

The Contractor is responsible for ensuring compliance with the requirements of this section. The following delineation of specific work responsibilities is specified to facilitate TAB execution of the various work efforts by personnel from separate organizations. This breakdown of specific duties is specified to facilitate adherence to the schedule listed in the paragraph TAB SUBMITTAL AND WORK SCHEDULE.

1.5.4.1 Contractor

a. TAB personnel: Ensure that the DALT work and the TAB work is accomplished by a group meeting the requirements specified in the paragraph TAB PERSONNEL QUALIFICATION REQUIREMENTS.

b. Pre-DALT/TAB meeting: Attend the meeting with the TAB Supervisor, and ensure that a representative is present for the sheetmetal contractor, mechanical contractor, electrical contractor, and automatic temperature controls contractor.

c. HVAC documentation: Furnish one complete set of the following HVAC-related documentation to the TAB agency:

(1) Contract drawings and specifications

(2) Approved submittal data for equipment

(3) Construction work schedule

(4) Up-to-date revisions and change orders for the previously listed items

d. Submittal and work schedules: Ensure that the schedule for submittals and work required by this section and specified in the paragraph TAB SUBMITTAL AND WORK SCHEDULE is met.

e. Coordination of supporting personnel:

Provide the technical personnel, such as factory representatives or HVAC controls installer required by the TAB field team to support the DALT and the TAB field measurement work.

Provide equipment mechanics to operate HVAC equipment and ductwork mechanics to provide the field designated test ports to enable TAB field team to accomplish the DALT and the TAB field measurement work. Ensure these support personnel are present at the times required by the TAB team, and cause no delay in the DALT and the TAB field work.

Conversely, ensure that the HVAC controls installer has required support from the TAB team field leader to complete the controls check out.

f. Deficiencies: Ensure that the TAB Agency supervisor submits all Design/Construction deficiency notifications directly to the Contracting officer within 3 days after the deficiency is encountered. Further, ensure that all such notification submittals are complete with explanation, including documentation, detailing deficiencies.

g. Prerequisite HVAC work: Complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Include as prerequisite work items, the deficiencies pointed out by the TAB team supervisor in the design review report.

h. Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's pre-field engineering report. Do not allow the TAB team to commence TAB field work until all of the following are completed.

(1) HVAC system installations are fully complete.

(2) HVAC prerequisite checkout work lists specified in the paragraph PRE-FIELD TAB ENGINEERING REPORT are completed, submitted, and approved. Ensure that the TAB Agency gets a copy of the approved prerequisite HVAC work checklist.

(3) DALT field checks for all systems are completed.

(4) HVAC system filters are clean for both Season 1 and Season 2 TAB field work.

i. Advance notice: Furnish to the Contracting Officer with advance written notice for the commencement of the DALT field work and for the commencement of the TAB field work.

j. Insulation work: For required DALT work , ensure that insulation is not installed on ducts to be DALT'd until DALT work on the subject

ducts is complete. Later, ensure that openings in duct and machinery insulation coverings for TAB test ports are marked, closed and sealed.

1.5.4.2 TAB Agency

Provide the services of a TAB team which complies with the requirements of the paragraph INDEPENDENT TAB AGENCY PERSONNEL QUALIFICATIONS. The work to be performed by the TAB agency is limited to testing, adjusting, and balancing of HVAC air and water systems to satisfy the requirements of this specification section.

1.5.4.3 TAB Team Supervisor

a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical DALT and TAB procedures and TAB team field work.

b. Pre-DALT/TAB meeting: Attend meeting with Contractor.

c. Design review report: Review project specifications and accompanying drawings to verify that the air systems and water systems are designed in such a way that the TAB engineer can accomplish the work in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.

d. Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the pre-field engineering report, the during the DALT or TAB field work.

e. Pre-field DALT preliminary notification: Monitor the completion of the duct installation of each system and provide the necessary written notification to the Contracting Officer.

f. Pre-field engineering report: Utilizing the following HVAC-related documentation; contract drawings and specifications, approved submittal data for equipment, up-to-date revisions and change orders; prepare this report.

g. Prerequisite HVAC work checklist: Ensure the Contractor gets a copy of this checklist at the same time as the pre-field engineering report is submitted.

h. Technical assistance for DALT work.

(1) Technical assistance: Provide immediate technical assistance to TAB field team.

(2) DALT field visit: Near the end of the DALT field work effort, visit the contract site to inspect the HVAC installation and the progress of the DALT field work. Conduct a site visit to the extent necessary to verify correct procedures are being implemented and to confirm the accuracy of the Pre-final DALT Report data which has been reported. Also, perform sufficient

evaluation to allow the TAB supervisor to issue certification of the final report. Conduct the site visit full-time for a minimum of one 8 hour workdays duration.

i. Final DALT report: Certify the DALT report. This certification includes the following work:

(1) Review: Review the Pre-final DALT report data. From these field reports, prepare the Certified Final DALT report.

(2) TAB Verification: Verify adherence, by the TAB field team, to the procedures specified in this section.

j. Technical Assistance for TAB Work: Provide immediate technical assistance to the TAB field team for the TAB work.

(1) TAB field visit: At the midpoint of the Season 1 and Season 2 TAB field work effort, visit the contract site to inspect the HVAC installation and the progress of the TAB field work. Conduct site visit full-time for a minimum of one 8 hour workdays duration.

(2) TAB field visit: Near the end of the TAB field work effort, visit the contract site to inspect the HVAC installation and the progress of the TAB field work. Conduct site visit full-time for a minimum of one8 hour workdays duration. Review the TAB final report data and certify the TAB final report.

(1) TAB field visit: Near the end of the TAB field work effort, visit the contract site to inspect the HVAC installation and the progress of the TAB field work. Conduct site visit full-time for a minimum of one 8 hour workdays duration. Review the TAB final report data and certify the TAB final report.

k. Certified TAB report: Certify the TAB report. This certification includes the following work:

(1) Review: Review the TAB field data report. From this field report, prepare the certified TAB report.

(2) Verification: Verify adherence, by the TAB field team, to the TAB plan prescribed by the pre-field engineering report and verify adherence to the procedures specified in this section.

l. Design/Construction deficiencies: Within 3 working days after the TAB Agency has encountered any design or construction deficiencies, the TAB Supervisor must submit written notification directly to the Contracting Officer, with a separate copy to the Contractor, of all such deficiencies. Provide in this submittal a complete explanation, including supporting documentation, detailing deficiencies. Where deficiencies are encountered that are believed to adversely impact successful completion of TAB, the TAB Agency must issue notice and request direction in the notification submittal.

m. TAB Field Check: The TAB team supervisor must attend and supervise Season 1 and Season 2 TAB field check.

1.5.4.4 TAB Team Field Leader

a. Field manager: Manage, in the field, the accomplishment of the work

specified in Part 3, EXECUTION.

b. Full time: Be present at the contract site when DALT field work or TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.

c. Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC Checklist, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

1.5.5 Test Reports

1.5.5.1 Data from DALT Field Work

Report the data for the Pre-final DALT Report and Certified Final DALT Report in compliance the following requirements:

a. Report format: Submit report data on Air Duct Leakage Test Summary Report Forms as shown on Page 6-2 of SMACNA 1972 CD. In addition, submit in the report, a marked duct shop drawing which identifies each section of duct tested with assigned node numbers for each section. Include node numbers in the completed report forms to identify each duct section. The TAB supervisor must review and certify the report.

b. The TAB supervisor must include a copy of all calculations prepared in determining the duct surface area of each duct test section. In addition,provide the ductwork air leak testing (DALT) reports with a copy(s) of the calibration curve for each of the DALT test orifices used for testing.

c. Instruments: List the types of instruments actually used to measure the data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Instruments must have been calibrated within one year of the date of use in the field. Instrument calibration must be traceable to the measuring standards of the National Institute of Standards and Technology.

d. Certification: Include the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

1.5.5.2 Certified TAB Reports

Submit: TAB Report for Season 1 and TAB Report for Season 2 in the following manner:

a. Report format: Submit the completed pre-field data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed and certified by the TAB supervisor. Bind the report with a waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data must be typewritten. Handwritten report forms or report data are not acceptable.

b. Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded. Include in

the TAB report continuous time versus temperature recording data of wet and dry bulb temperatures for the rooms, or zones, as designated in the following list:

(1) Specifier: List desired rooms and/or zones here. Measure and compile data on a continuous basis for the period in which TAB work affecting those rooms is being done.

(2) Measure and record data only after the HVAC systems installations are complete, the systems fully balanced and the HVAC systems controls operating in fully automatic mode.

(3) Data may be compiled using direct digital controls trend logging where available. Otherwise, temporarily install calibrated time versus temperature/humidity recorders for this purpose. The HVAC systems and controls must be fully operational a minimum of 24 hours in advance of commencing data compilation. Include the specified data in theSeason I TAB ReportSeason I and Season 2 TAB Report.

c. System Diagrams: Provide updated diagrams with final installed locations of all terminals and devices, any numbering changes, and actual test locations. Use a key numbering system on the diagram which identifies each outlet contained in the outlet airflow report sheets.

d. Static Pressure Profiles: Report static pressure profiles for air duct systems including: Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the systems listed. Include the following in the static pressure report data, in addition to AABC/NEBB/TABB required data:

(1) Report supply fan, return fan, relief fan, and exhaust fan inlet and discharge static pressures.

(2) Report static pressure drop across chilled water coils, DX coils, hot water coils, steam coils, electric resistance heating coils and heat reclaim devices installed in unit cabinetry or the system ductwork.

(3) Report static pressure drop across outside air, return air, and supply air automatic control dampers, both proportional and two-position, installed in unit cabinetry.

(4) Report static pressure drop across air filters, acoustic silencers, moisture eliminators, air flow straighteners, air flow measuring stations or other pressure drop producing specialty items installed in unit cabinetry, or in the system ductwork. Examples of these specialty items are smoke detectors, white sound generators, RF shielding, wave guides, security bars, blast valves, small pipes passing through ductwork, and duct mounted humidifiers.

Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows, transitions, offsets, plenums, manual dampers, and branch takes-offs.

(5) Report static pressure drop across outside air and relief/exhaust

air louvers.

(6) Report static pressure readings of supply air, return air, exhaust/relief air, and outside air in duct at the point where these ducts connect to each air moving unit.and also at the following locations:

Main Duct: Take readings at four locations along the full length of the main duct, 25 percent, 50 percent, 75 percent, and 100 percent of the total duct length.

Floor Branch Mains: Take readings at floor branch mains served by a main duct vertical riser.

e. Duct Traverses: Report duct traverses for mainand branch main supply, return, exhaust, relief and outside air ducts. This includes all ducts, including those which lack 7 1/2 duct diameters upstream and 2 1/2 duct diameters downstream of straight duct unobstructed by duct fittings/offsets/elbows. The TAB Agency must evaluate and report findings on the duct traverses taken. Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a pilot traverse plane as defined by AMCA 203, "Field Measurements", Section 8, paragraph 8.3, "Location of Traverse Plane."

f. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

Instrumentation, used for taking wet bulb temperature readings must provide accuracy of plus or minus 5 percent at the measured face velocities. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified.

g. Certification: Include the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

h. Performance Curves: The TAB Supervisor must include, in the TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job.

i. Calibration Curves: The TAB Supervisor must include, in the TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturi's and flow orifices TAB'd on the job.

## 1.6 SEQUENCING AND SCHEDULING

### 1.6.1 Projects with Phased Construction

This specification section is structured as though the HVAC construction, and thereby the TAB work, will be completed in a single phase. When the construction is completed in phases, the DALT work and TAB work must be planned, completed, and accepted for each construction phase.

#### 1.6.1.1 Phasing of Work

This specification section is structured as though the HVAC construction,

and thereby the TAB work, is going to be completed in a single phase in spite of the fact that there will be two seasons. All elements of the TAB work are addressed on this premise. When a contract is to be completed in construction phases, including the TAB work, and the DALT work, the TAB work and DALT work must be planned for, completed and approved by the Contracting Officer with each phase. An example of this case would be one contract that requires the rehabilitation of the HVAC in each of several separated buildings. At the completion of the final phase, compile all approved reports and submit as one document.

### 1.6.2 DALT and TAB Submittal and Work Schedule

Submit this schedule,and TAB Schematic Drawings, adapted for this particular contract, to the Contracting Officer (CO) for review and approval. Include with the submittal the planned calendar dates for each submittal or work item. Resubmit an updated version for CO approval every 90 calendar days. Compliance with the following schedule is the Contractor's responsibility.

Qualify TAB Personnel: Within 45 calendar days after Notice to proceed (NTP), submit TAB agency and personnel qualifications.

Pre-DALT/TAB Meeting: Within 30 calendar days after the date of approval of the TAB agency and personnel, meet with the COTR.

Design Review Report: Within 60 calendar days after the date of the TAB agency personnel qualifications approval, submit design review report.

Pre-Field DALT Preliminary Notification: On completion of the duct installation for each system, notify the Contracting Officer in writing within 5 days after completion.

Ductwork Selected for DALT: Within 7 calendar days of Pre-Field DALT Preliminary Notification, the COTR will select which of the project ductwork must be DALT'd.

DALT Field Work: Within 48 hours of COTR's selection, complete DALT field work on selected.

Submit Pre-final DALT Report: Within one working day after completion of DALT field work, submit Pre-final DALT Report. Separate Pre-final DALT reports may be submitted to allow phased testing from system to system.

DALT Work Field Check: Upon approval of the Pre-final DALT Report, schedule the COTR's DALT field check work with the Contracting Officer.

Submit Final DALT Report: Within 15 calendar days after completion of successful DALT Work Field Check, submit Season 1 TAB report.

Pre-Field TAB Engineering Report: Within 15 calendar days after approval of the TAB agency Personnel Qualifications, submit the Pre-Field TAB Engineering Report.

Prerequisite HVAC Work Checkout List For Season 1 and Advanced Notice For Season 1 TAB Field Work: At a minimum of 115 calendar days prior

to CCD, submit Season 1 prerequisite HVAC work check out list certified as complete, and submit advance notice of commencement of Season 1 TAB field work.

Season 1 TAB Field Work: At a minimum of 90 calendar days prior to CCD, and when the ambient temperature is within Season 1 limits, accomplish Season 1 TAB field work.

Submit Season 1 TAB Report: Within 15 calendar days after completion of Season 1 TAB field work, submit Season 1 TAB report.

Season 1 TAB Field Check: 30 calendar days after Season 1 TAB report is approved by the Contracting Officer, conduct Season 1 field check.

Complete Season 1 TAB Work: Prior to CCD, complete all TAB work except Season 2 TAB work.

Prerequisite HVAC Work Check Out List For Season 2 and Advanced Notice For Season 2 TAB Field Work: Within 150 calendar days after date of the commencement of the Season 1 TAB field work, submit the Season 2 prerequisite HVAC work check out list certified as complete and submit advance notice of commencement of Season 2 TAB field work.

Season 2 TAB Field Work: Within 180 calendar days after date of commencement of the Season 1 TAB field work and when the ambient temperature is within Season 2 limits, accomplish Season 2 TAB field work.

Submit Season 2 TAB Report: Within 15 calendar days after completion of Season 2 TAB field work, submit Season 2 TAB report.

Season 2 TAB Field Check: 30 calendar days after the Season 2 TAB report is approved by the Contracting Officer, conduct Season 2 field check.

Complete Season 2 TAB Work: Within 15 calendar days after the completion of Season 2 TAB field data check, complete all TAB work.

1.6.2.1 TAB Design Review Report

Submit typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the duct leakage testing work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. State that no deficiencies are evident if that is the case.

1.6.2.2 Pre-Field DALT Preliminary Notification

Notification: On completion of the installation of each duct system indicated to be DALT'd, notify the Contracting Officer in writing within 7 calendar days after completion.

1.6.2.3 TAB Pre-Field Engineering Report

Submit report containing the following information:

a. Step-by-step TAB procedure:

(1) Strategy: Describe the method of approach to the TAB field work from start to finish. Include in this description a complete methodology for accomplishing each seasonal TAB field work session.

(2) Air System Diagrams: Use the contract drawings and duct fabrication drawings if available to provide air system diagrams in the report showing the location of all terminal outlet supply, return, exhaust and transfer registers, grilles and diffusers. Use a key numbering system on the diagrams which identifies each outlet contained in the outlet airflow report sheets. Show intended locations of all traverses and static pressure readings.

(3) Procedural steps: Delineate fully the intended procedural steps to be taken by the TAB field team to accomplish the required TAB work of each air distribution system and each water distribution system. Include intended procedural steps for TAB work for subsystems and system components.

b. Pre-field data: Submit AABC or NEBB or SMACNA 1780 data report forms with the following pre-field information filled in:

(1) Design data obtained from system drawings, specifications, and approved submittals.

(2) Notations detailing additional data to be obtained from the contract site by the TAB field team.

(3) Designate the actual data to be measured in the TAB field work.

(4) Provide a list of the types of instruments, and the measuring range of each, which are anticipated to be used for measuring in the TAB field work. By means of a keying scheme, specify on each TAB data report form submitted, which instruments will be used for measuring each item of TAB data. If the selection of which instrument to use, is to be made in the field, specify from which instruments the choice will be made. Place the instrument key number in the blank space where the measured data would be entered.

c. Prerequisite HVAC work checkout list: Provide a list of inspections and work items which are to be completed by the Contractor. This list must be acted upon and completed by the Contractor and then submitted and approved by the Contracting Officer prior to the TAB team coming to the contract site.

At a minimum, a list of the applicable inspections and work items listed in the NEBB PROCEDURAL STANDARDS, Section III, "Preliminary TAB Procedures" under paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" must be provided for each separate system to be TAB'd.

## PART 2 PRODUCTS

Not Used

# PART 3 EXECUTION

## 3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements of this section.

## 3.2 PRE-DALT/TAB MEETING

Meet with the Contracting Officer's technical representative (COTR)and the designing engineer of the HVAC systems to develop a mutual understanding relative to the details of the DALT work and TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

## 3.3 DALT PROCEDURES

### 3.3.1 Instruments, Consumables and Personnel

Provide instruments, consumables and personnel required to accomplish the DALT field work. Follow the same basic procedure specified below for TAB Field Work, including maintenance and calibration of instruments, accuracy of measurements, preliminary procedures, field work, workmanship and treatment of deficiencies. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

### 3.3.2 Advance Notice of Pre-Final DALT Field Work

On completion of the installation of each duct system indicated to be DALT'd, notify the Contracting Officer in writing prior to the COTR's duct selection field visit.

### 3.3.3 Ductwork To Be DALT'd

From each duct system indicated as subject to DALT, the COTR will randomly select sections of each completed duct system for testing by the Contractor's TAB Firm. The sections selected will not exceed 20 percent of the total measured linear footage of duct systems indicated as subject to DALT. Sections of duct systems subject to DALT will include 20 percent of main ducts, branch main ducts, branch ducts and plenums for supply, return, exhaust, and plenum ductwork.

It is acceptable for an entire duct system to be DALT'd instead of disassembling that system in order to DALT only the 20 percent portion specified above.

### 3.3.4 DALT Testing

Perform DALT on the HVAC duct sections of each system as selected by the COTR. Use the duct class, seal class, leakage class and the leak test pressure data indicated on the drawings, to comply with the procedures specified in SMACNA 1972 CD.

In spite of specifications of SMACNA 1972 CD to the contrary, DALT ductwork of construction class of 746 Pa water gauge static pressure and below if indicated to be DALT'd. Complete DALT work on the COTR selected ductwork within 48 hours after the particular ductwork was selected for DALT. Separately conduct DALT work for large duct systems to enable the DALT work to be completed in 48 hours.

### 3.3.5 Completed Pre-Final DALT Report

After completion of the DALT work, prepare a Pre-final DALT Report using the reporting forms specified. TAB team to furnish data required by those data report forms. Prepare the report neatly and legibly; the Pre-final DALT report is the basis for the Final DALT Report. TAB supervisor must review and certify the Pre-final DALT Report and submit this report within one day of completion of DALT field work. Verbally notify the COTR that the field check of the Pre-final DALT Report data can commence.

### 3.3.6 Quality Assurance - COTR DALT Field Acceptance Testing

In the presence of the COTR and TAB team field leader, verify for accuracy Pre-final DALT Report data selected by the COTR. For each duct system, this acceptance testing shall be conducted on a maximum of 50 percent of the duct sections DALT'd.

Further, if any data on the Pre-final DALT report form for a given duct section is out-of-tolerance, then field acceptance testing shall be conducted on data for one additional duct section, preferably in the same duct system, in the presence of the COTR.

### 3.3.7 Additional COTR Field Acceptance Testing

If any of the duct sections checked for a given system are determined to have a leakage rate measured that exceeds the leakage rate allowed by SMACNA Leak Test Manual for an indicated duct construction class and sealant class, terminate data checking for that section. The associated Pre-final DALT Report data for the given duct system will be disapproved. Make the necessary corrections and prepare a revised Pre-final DALT Report. Reschedule a field check of the revised report data with the COTR.

### 3.3.8 Certified Final DALT Report

On successful completion of all field checks of the Pre-final DALT Report data for all systems, the TAB Supervisor is to assemble, review, certify and submit the Final DALT Report to the Contracting Officer for approval.

### 3.3.9 Prerequisite for TAB Field Work

Do not commence TAB field work prior to the completion and approval, for all systems, of the Final DALT Report.

## 3.4 TAB PROCEDURES

### 3.4.1 TAB Field Work

Test, adjust, and balance the HVAC systems until measured flow rates (air and water flow) are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents.

That is, comply with the the requirements of AABC MN-1 or SMACNA 1780 (TABB) and SMACNA 1858 (TABB),except as supplemented and modified by this section.

Provide instruments and consumables required to accomplish the TAB work. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

Test, adjust, and balance the HVAC systems until measured flow rates (air and water flow) are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. Conduct TAB work, including measurement accuracy, and sound measurement work in conformance with the AABC MN-1 and AABC MN-4, or NEBB TABES and NEBB MASV, or SMACNA 1780 (used by TABB) and SMACNA 1858 sound measurement procedures, except as supplemented and modified by this section. The only water flow and air flow reporting which can be deferred until the Season 2 is that data which would be affected in terms of accuracy due to outside ambient conditions.

### 3.4.2 Preliminary Procedures

Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. TAB engineer is to locate, in the field, test ports required for testing. It is the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB engineer.

### 3.4.3 TAB Air Distribution Systems

#### 3.4.3.1 Units With Coils

Report heating and cooling performance capacity tests for hot water, chilled water, DX and steam coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:

a. For air handlers with capacities greater than 26,370 Watts cooling, such as factory manufactured units, central built-up units and rooftop units, conduct capacity tests in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing."

   Do not determine entering and leaving wet and dry bulb temperatures by single point measurement, but by the average of multiple readings in compliance with paragraph 3.5-5, "Procedures", (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing."

   Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; use the data for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity Vs. Design Capacity" (in subparagraph c.).

b. For units with capacities of 26370 Watts or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units, such as through-the-wall heat pumps:

   Determine the apparent coil capacity by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; submit the calculations with the coil reports.

#### 3.4.3.2 Rooftop Air Conditioning(for DOAS)

Rooftop air conditioning systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

For refrigeration compressors/condensers/condensing units/evaporators, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.4.3.3 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.

3.4.4 Sound Measurement Work

3.4.4.1 Areas To Be Sound Measured

In the following spaces, measure and record the sound power level for each octave band listed in ASHRAE HVAC APP SI HDBK Noise Criteria:

a. All HVAC mechanical rooms, including machinery spaces and other spaces containing HVAC power drivers and power driven equipment.

b. All spaces sharing a common barrier with each mechanical room, including rooms overhead, rooms on the other side of side walls, and rooms beneath the mechanical room floor.

3.4.4.2 Procedure

Measure sound levels in each room, when unoccupied except for the TAB team, with all HVAC systems that would cause sound readings in the room operating in their noisiest mode. Record the sound level in each octave band. Attempt to mitigate the sound level and bring the level to within the specified ASHRAE HVAC APP SI HDBK noise criteria goals, if such mitigation is within the TAB team's control. State in the report the ASHRAE HVAC APP SI HDBK noise criteria goals. If sound level cannot be brought into compliance, provide written notice of the deficiency to the Contractor for resolution or correction.

3.4.4.3 Timing

Measure sound levels at times prescribed by AABC or NEBB or TABB.

3.4.4.4 Meters

Measure sound levels with a sound meter complying with ASA S1.4, Type 1 or 2, and an octave band filter set complying with ASA S1.11 PART 1. Use measurement methods for overall sound levels and for octave band sound levels as prescribed by NEBB.

3.4.4.5 Calibration

Calibrate sound levels as prescribed by AABC or NEBB or TABB, except that calibrators emitting a sound pressure level tone of 94 dB at 1000 hertz (Hz) are also acceptable.

3.4.4.6 Background Noise Correction

Determine background noise component of room sound (noise) levels for each (of eight) octave bands as prescribed by AABC or NEBB or TABB.

### 3.4.5 TAB Work on Performance Tests Without Seasonal Limitations

#### 3.4.5.1 Performance Tests

In addition to the TAB proportionate balancing work on the air distribution systems , accomplish TAB work on the HVAC systems which directly transfer thermal energy. TAB the operational performance of the heating systemsandcooling systems.

#### 3.4.5.2 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. Record these temperatures at beginning and at the end of data taking.

#### 3.4.5.3 Sound Measurements

Comply with the paragraph SOUND MEASUREMENT WORK, specifically, the requirement that a room must be operating in its noisiest mode at the time of sound measurements in the room. The maximum noise level measurements could depend on seasonally related heat or cooling transfer equipment.

### 3.4.6 Workmanship

Conduct TAB work on the HVAC systems until measured flow rates are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. This TAB work includes adjustment of balancing valves, balancing dampers, and sheaves. Further, this TAB work includes changing out fan sheaves and pump impellers if required to obtain air and water flow rates specified or indicated. If, with these adjustments and equipment changes, the specified or indicated design flow rates cannot be attained, contact the Contracting Officer for direction.

### 3.4.7 Deficiencies

Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph WORKMANSHIP, provide written notice as soon as possible to the Contractor and the Contracting Officer describing the deficiency and recommended correction.

Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB team supervisor's.

### 3.4.8 TAB Reports

After completion of the TAB field work, prepare the TAB field data for TAB supervisor's review and certification, using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms is to be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report is considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph WORKMANSHIP.

After completion of the TAB work, prepare a pre-final TAB report using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms is to be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and the TAB report is considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph WORKMANSHIP of this section.

Prepare the report neatly and legibly; the pre-final TAB report is the final TAB report minus the TAB supervisor's review and certification. Obtain, at the contract site, the TAB supervisor's review and certification of the TAB report.

Verbally notify the COTR that the field check of the TAB report data can commence; give this verbal notice 48 hours in advance of field check commencement. Do not schedule field check of the TAB report until the specified workmanship requirements have been met or written approval of the deviations from the requirements have been received from the Contracting Officer.

### 3.4.9 Quality Assurance - COTR TAB Field Acceptance Testing

#### 3.4.9.1 TAB Field Acceptance Testing

During the field acceptance testing, verify, in the presence of the COTR, random selections of data (water, air quantities, air motion, sound level readings) recorded in the TAB Report. Points and areas for field acceptance testing are to be selected by the COTR. Measurement and test procedures are the same as approved for TAB work for the TAB Report.

Field acceptance testing includes verification of TAB Report data recorded for the following equipment groups:

Group 1: 25 percent of the return grilles, return registers, exhaust grilles and exhaust registers.

Group 2: 25 percent of the supply fans, exhaust fans, and pumps.

Further, if any data on the TAB Report for Groups 2 through 5 is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, additional group data verification is required in the presence of the COTR. Verify TAB Report data for one additional piece of equipment in that group. Continue this additional group data verification until out-of-tolerance data ceases to be found.

#### 3.4.9.2 Additional COTR TAB Field Acceptance Testing

If any of the acceptance testing measurements for a given equipment group is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, terminate data verification for all affected data for that group. The affected data for the given group will be disapproved. Make the necessary corrections and prepare a revised TAB Report. Reschedule acceptance testing of the revised report data with the COTR.

Further, if any data on the TAB Report for a given field acceptance test group is out-of-tolerance, then field test data for one additional field test group as specified herein. Continue this increase field test work until out-of-tolerance data ceases to to be found. This additional field testing is up and above the original 25 percent of the of reported data

entries to be field tested.

If there are no more similar field test groups from which to choose, additional field testing from another, but different, type of field testing group must be tested.

3.4.9.3 Prerequisite for Approval

Compliance with the field acceptance testing requirements of this section is a prerequisite for the final Contracting Officer approval of the TAB Report submitted.

## 3.5 MARKING OF SETTINGS

Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, gauges, splitters, and dampers so that adjustment can be restored if disturbed at any time. Provide permanent markings clearly indicating the settings on the adjustment devices which result in the data reported on the submitted TAB report.

## 3.6 MARKING OF TEST PORTS

The TAB team is to permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, make these markings on the exterior side of the duct insulation. Show the location of test ports on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

-- End of Section --

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# SECTION 23 07 00

# THERMAL INSULATION FOR MECHANICAL SYSTEMS
**02/13**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C647 | (2008; R 2013) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation |
| ASTM C921 | (2010) Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation |
| ASTM C1136 | (2017a) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation |
| ASTM D882 | (2012) Tensile Properties of Thin Plastic Sheeting |
| ASTM D5590 | (2000; R 2010; E 2012) Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay |
| ASTM E84 | (2020) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E96/E96M | (2021) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials |
| ASTM E2231 | (2018) Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics |

FM GLOBAL (FM)

| | |
|---|---|
| FM APP GUIDE | (updated on-line) Approval Guide http://www.approvalguide.com/ |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 90A | (2021) Standard for the Installation of Air Conditioning and Ventilating Systems |
| NFPA 90B | (2018) Standard for the Installation of Warm Air Heating and Air Conditioning Systems |

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

| | |
|---|---|
| TAPPI T403 OM | (2015) Bursting Strength of Paper |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| MIL-A-24179 | (1969; Rev A; Am 2 1980; Notice 1 1987) Adhesive, Flexible Unicellular-Plastic Thermal Insulation |
| MIL-A-3316 | (1987; Rev C; Am 2 1990) Adhesives, Fire-Resistant, Thermal Insulation |
| MIL-PRF-19565 | (1988; Rev C) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5538 | (2003) Adhesives for Wall and Ceiling Boards |
| JIS A 9504 | (2021) Man Made Mineral Fibre Thermal Insulation Materials |
| JIS G 4304 | (2012) Hot-Rolled Stainless Steel Plate, Sheet and Strip |
| JIS H 4000 | (2017) Aluminium and Aluminium Alloy Sheets, Strips and Plates (Amendment 1) |

MLIT MECHANICAL STANDARD SPECIFICATION

| | |
|---|---|
| MLIT-M | (2019) Public Building Construction Standard Specification |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 723 | (2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials |

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 General

Provide field-applied insulation and accessories on mechanical systems as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Submit the three SD types, SD-02 Shop Drawings, SD-03 Product Data, and SD-08 Manufacturer's Instructions at the same time for each system.

SD-02 Shop Drawings

Pipe Insulation Systems and Associated Accessories

Duct Insulation Systems and Associated Accessories

Equipment Insulation Systems and Associated Accessories

## 1.4 CERTIFICATIONS

### 1.4.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements of JIS A 5538.

## 1.5 QUALITY ASSURANCE

### 1.5.1 Installer Qualification

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material, date codes, and approximate shelf life (if applicable). Insulation packages and containers shall be asbestos free.

# PART 2 PRODUCTS

## 2.1 STANDARD PRODUCTS

Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit a complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories including adhesives, sealants and

jackets for each mechanical system requiring insulation shall be included. The product data must be copyrighted, have an identifying or publication number, and shall have been published prior to the issuance date of this solicitation. Materials furnished under this section shall be submitted together in a booklet.

2.1.1 Insulation System

Provide insulation systems in accordance with MLIT-M. Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems that are located within, on, under, and adjacent to buildings; and for plumbing systems.

2.1.2 Surface Burning Characteristics

Unless otherwise specified, insulation must have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flame spread, and smoke developed indexes,shall be determined by ASTM E84 or UL 723. Test insulation in the same density and installed thickness as the material to be used in the actual construction. Prepare and mount test specimens according to ASTM E2231.

2.2 MATERIALS

Insulation exterior shall be cleanable, grease resistant, non-flaking and non-peeling. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either wet or dry state.

2.2.1 Adhesives

2.2.1.1 Acoustical Lining Insulation Adhesive

Adhesive shall be a nonflammable, fire-resistant adhesive conforming to JIS A 5538.

2.2.1.2 Mineral Fiber Insulation Cement

Cement shall be in accordance with JIS A 9504.

2.2.1.3 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. To resist mold/mildew, lagging adhesive shall meet ASTM D5590 with 0 growth rating. Lagging adhesives shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Adhesive shall be MIL-A-3316, Class 1, pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation.

2.2.1.4 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprene based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 100 degrees C. The dried adhesive shall be nonflammable and fire resistant. Flexible Elastomeric Adhesive: Comply with MIL-A-24179, Type II, Class I. Provide product listed in FM APP GUIDE.

2.2.2 Caulking

Caulking shall be in accordance with MLIT-M.

2.2.3 Corner Angles

Nominal 0.406 mm aluminum 25 by 25 mm with factory applied kraft backing. Aluminum shall be JIS H 4000.

2.2.4 Finishing Cement

MLIT-M: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with MLIT-M.

2.2.5 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20X20 maximum mesh size, and glass tape shall be have maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Tape shall be 100 mm wide rolls. Class 3 tape shall be 0.15 kg/square m. Elastomeric Foam Tape: Black vapor-retarder foam tape with acrylic adhesive containing an anti-microbial additive.

2.2.6 Staples

Outward clinching type monel, JIS G 4304, Type 304 or 316 stainless steel.

2.2.7 Jackets

2.2.7.1 Vapor Barrier/Weatherproofing Jacket

Vapor barrier/weatherproofing jacket shall be in accordance with MLIT-M, Table 2.3.1 and 2.3.2.

2.2.8 Vapor Retarder Required

ASTM C921, Type I, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork, where a minimum puncture resistance of 25 Beach units is acceptable. Minimum tensile strength, 6.1 N/mm width. ASTM C921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 3.5 N/mm width. Jackets used on insulation exposed in finished areas shall have white finish suitable for painting without

sizing. Based on the application, insulation materials that require manufacturer or fabricator applied pipe insulation jackets are cellular glass, when all joints are sealed with a vapor barrier mastic, and mineral fiber. All non-metallic jackets shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flexible elastomerics require (in addition to vapor barrier skin) vapor retarder jacketing for high relative humidity and below ambient temperature applications.

2.2.8.1 Vapor Retarder/Vapor Barrier Mastic Coatings

2.2.8.1.1 Vapor Barrier

The vapor barrier shall be self adhesive (minimum 0.05 mm adhesive, 0.075 mm embossed) greater than 3 plies standard grade, silver, white, black and embossed white jacket for use on hot/cold pipes. Permeability shall be less than 0.02 when tested in accordance with ASTM E96/E96M. Products shall meet UL 723 or ASTM E84. Flame and smoke requirements and shall be UV resistant.

2.2.8.1.2 Vapor Retarder

The vapor retarder coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall be 0.013 perms or less at 1 mm dry film thickness as determined according to procedure B of ASTM E96/E96M or utilizing apparatus described in ASTM E96/E96M. The coating shall be nonflammable, fire resistant type. To resist mold/mildew, coating shall meet ASTM D5590 with 0 growth rating. Coating shall meet MIL-PRF-19565 Type II (if selected for indoor service) and be Qualified Products Database listed. All other application and service properties shall be in accordance with ASTM C647.

2.2.8.2 Laminated Film Vapor Retarder

ASTM C1136, Type I, maximum moisture vapor transmission 0.02 perms, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork; where Type II, maximum moisture vapor transmission 0.02 perms, a minimum puncture resistance of 25 Beach units is acceptable. Vapor retarder shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flexible Elastomeric exterior foam with factory applied UV Jacket. Construction of laminate designed to provide UV resistance, high puncture, tear resistance and an excellent WVT rate.

2.2.8.3 Polyvinylidene Chloride (PVDC) Film Vapor Retarder

The PVDC film vapor retarder shall have a maximum moisture vapor transmission of 0.02 perms, minimum puncture resistance of 150 Beach units, a minimum tensile strength in any direction of 5.3 kN/m when tested in accordance with ASTM D882, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.2.8.4 Vapor Barrier/Weather Barrier

The vapor barrier shall be greater than 3 ply self adhesive laminate -white vapor barrier jacket- superior performance (less than 0.0000 permeability when tested in accordance with ASTM E96/E96M). Vapor barrier shall meet UL 723 or ASTM E84. 25 flame and 50 smoke requirements; and UV

resistant. Minimum burst strength 1.3 MPa in accordance with TAPPI T403 OM. Tensile strength 0.12 kg/m width (PSTC-1000). Tape shall be as specified for laminated film vapor barrier above.

2.2.9 Wire

Wire shall be in accordance with MLIT-M.

2.2.10 Sealants

Sealants shall be chosen from the butyl polymer type, the styrene-butadiene rubber type, or the butyl type of sealants. Sealants shall have a maximum permeance of 0.02 perms based on Procedure B for ASTM E96/E96M, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.3 PIPE INSULATION SYSTEMS

Conform insulation materials to Table 1 and minimum insulation thickness as listed in Table 2 and meet. Limit pipe insulation materials to those listed herein and meeting the following requirements:

2.3.1 Aboveground Cold Pipeline (-34 to 16 deg. C)

Insulation for outdoor, indoor, exposed or concealed applications, shall be as follows:

2.3.1.1 Mineral Fiber Insulation with Integral Wicking Material (MFIWM)

JIS A 9504. Install in accordance with manufacturer's instructions. Do not use in applications exposed to outdoor ambient conditions in climatic zones 1 through 4.

2.3.2 Aboveground Hot Pipeline (Above 16 deg. C)

Insulation for outdoor, indoor, exposed or concealed applications shall meet the following requirements. Supply the insulation with manufacturer's recommended factory-applied jacket/vapor barrier.

2.3.2.1 Mineral Fiber

JIS A 9504, supply the insulation with manufacturer's recommended factory-applied jacket.

2.4 DUCT INSULATION SYSTEMS

2.4.1 Factory Applied Insulation

Provide factory-applied insulation for insulation with insulation manufacturer's standard reinforced fire-retardant vapor barrier.

2.4.1.1 Clothes Dryer Exhaust Duct Insulation

Provide clothes dryer exhaust duct insulation to prevent condensation.

2.4.2 Duct Insulation Jackets

2.4.2.1 All-Purpose Jacket

Provide insulation with insulation manufacturer's standard reinforced fire-retardant jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jacket with a white surface suitable for field painting.

2.4.2.2 Metal Jackets

2.4.2.2.1 Stainless Steel Jackets

JIS G 4304; Type 304, smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 13 mm.

2.5 EQUIPMENT INSULATION SYSTEMS

Insulate equipment and accessories as specified in accordance with MLIT-M, Chapter 3.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Insulation shall only be applied to unheated and uncooled piping. Flexible elastomeric cellular insulation shall not be compressed at joists, studs, columns, ducts, hangers, etc. The insulation shall not pull apart after a one hour period; any insulation found to pull apart after one hour, shall be replaced.

3.1.1 Display Samples

Submit and display, after approval of materials, actual sections of installed systems, properly insulated in accordance with the specification requirements. Such actual sections must remain accessible to inspection throughout the job and will be reviewed from time to time for controlling the quality of the work throughout the construction site. Each material used shall be identified, by indicating on an attached sheet the specification requirement for the material and the material by each manufacturer intended to meet the requirement. The Contracting Officer will inspect display sample sections at the jobsite. Approved display sample sections shall remain on display at the jobsite during the construction period. Upon completion of construction, the display sample sections will be closed and sealed.

3.1.1.1 Pipe Insulation Display Sections

Display sample sections shall include as a minimum an elbow or tee, a valve, dielectric waterways and flanges, a hanger with protection shield and insulation insert, or dowel as required, at support point, method of fastening and sealing insulation at longitudinal lap, circumferential lap, butt joints at fittings and on pipe runs, and terminating points for each type of pipe insulation used on the job, and for hot pipelines and cold pipelines, both interior and exterior, even when the same type of insulation is used for these services.

#### 3.1.1.2 Duct Insulation Display Sections

Display sample sections for rigid and flexible duct insulation used on the job. Use a temporary covering to enclose and protect display sections for duct insulation exposed to weather.

### 3.1.2 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests and heat tracing specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the jobsite. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with plates except where modified herein or on the drawings.

### 3.1.3 Firestopping

Where pipes and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials as specified in Section 07 84 00 FIRESTOPPING. The protection of ducts at point of passage through firewalls must be in accordance with NFPA 90A and/or NFPA 90B. All other penetrations, such as piping, conduit, and wiring, through firewalls must be protected with a material or system of the same hourly rating that is listed by MLIT-M.

### 3.1.4 Painting and Finishing

Painting shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

### 3.1.5 Pipes/Ducts That Require Insulation

Insulation is required on all pipes, ducts, except for omitted items as specified.

## 3.2 PIPE INSULATION SYSTEMS INSTALLATION

Install pipe insulation systems in accordance with the approved plates as supplemented by the manufacturer's published installation instructions.

### 3.2.1 Pipe Insulation

#### 3.2.1.1 General

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder/barrier, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting

each other shall not be used. Pipe insulation shall be omitted on the following:

a. Pipe used solely for fire protection.

b. Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped shall have the hot water supply and drain, including the trap, insulated where exposed.

c. Sanitary drain lines.

d. Air chambers.

e. Adjacent insulation.

f. Access plates of fan housings.

g. Cleanouts or handholes.

3.2.1.2 Pipe Insulation Material and Thickness

Pipe insulation materials must be as listed in Table 1.

| TABLE 1 | | | | | |
|---|---|---|---|---|---|
| Insulation Material for Piping | | | | | |
| Service | | | | | |
| | Material | Specification | Type | Class | VR/VB Req'd |
| Cold Domestic Water Piping, Makeup Water & Drain Piping | | | | | |
| | Mineral Fiber | JIS A 9504 | | | |
| Hot Domestic Water Supply & Recirculating Piping (Max 93 C) | | | | | |
| | Mineral Fiber | JIS A 9504 | | | |
| Refrigerant Piping (1.67 degrees C nominal) | | | | | |
| | Shall be pre-insulated by manufacturer | | | | |
| Horizontal Roof Drain Leaders (Including Underside of Roof Drain Fittings) | | | | | |
| | Mineral Fiber | JIS A 9504 | | | |
| Condensate Drain Located Inside Building | | | | | |
| | Mineral Fiber | JIS A 9504 | | | |

| TABLE 1 | | | | | |
|---|---|---|---|---|---|
| Insulation Material for Piping | | | | | |
| Service | | | | | |
| | Material | Specification | Type | Class | VR/VB Req'd |
| Note: VR/VB = Vapor Retarder/Vapor Barrier | | | | | |

| TABLE 2 | | | | | | |
|---|---|---|---|---|---|---|
| Piping Insulation Thickness (mm)<br>Economic thickness or prevention of condensation is the basis of these tables. If prevention of condensation is the criterion, the ambient temperature and relative humidity must be stated. Do not use integral wicking material in Chilled water applications exposed to outdoor ambient conditions in climatic zones 1 through 4. | | | | | | |
| Service | | | | | | |
| | Material | Tube And Pipe Size (mm) | | | | |
| | | <25 | 25-<40 | 40-<100 | 100-<200 | > or = 200 |
| Cold Domestic Water Piping, Makeup Water & Drain Piping | | | | | | |
| | Mineral Fiber | 40 | 40 | 50 | 50 | 50 |
| | Flexible Elastomeric Cellular | 25 | 25 | 25 | N/A | N/A |
| Hot Domestic Water Supply & Recirculating Piping (Max 93 C) | | | | | | |
| | Mineral Fiber | 25 | 25 | 25 | 40 | 40 |
| Refrigerant Piping (1.67 degrees C nominal) | | | | | | |
| | Shall be pre-insulated by manufacturer | 20 | 20 | N/A | N/A | N/A |
| Exposed Lavatory Drains, Exposed Domestic Water Piping & Drains to Areas for Handicapped Personnel | | | | | | |
| | Mineral Fiber | 40 | 40 | 50 | 50 | 50 |
| Horizontal Roof Drain Leaders (Including Underside of Roof Drain Fittings) | | | | | | |
| | Mineral Fiber | 40 | 40 | 50 | 50 | 50 |
| Condensate Drain Located Inside Building | | | | | | |

| TABLE 2 | | | | | | |
|---|---|---|---|---|---|---|
| Piping Insulation Thickness (mm)<br>Economic thickness or prevention of condensation is the basis of these tables. If prevention of condensation is the criterion, the ambient temperature and relative humidity must be stated. Do not use integral wicking material in Chilled water applications exposed to outdoor ambient conditions in climatic zones 1 through 4. | | | | | | |
| Service | | | | | | |
| | Material | Tube And Pipe Size (mm) | | | | |
| | | <25 | 25-<40 | 40-<100 | 100-<200 | > or = 200 |
| | Mineral Fiber | 40 | 40 | 50 | 50 | 50 |

3.2.2 Aboveground Cold Pipelines

The following cold pipelines for minus 34 to plus 16 degrees C, shall be insulated in accordance with Table 2 except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted. This includes but is not limited to the following:

a. Make-up water.

b. Horizontal and vertical portions of interior roof drains.

c. Refrigerant suction lines.

Air conditioner condensate drains.

Domestic cold water.

3.2.2.1 Insulation Material and Thickness

Insulation thickness for cold pipelines shall be determined using Table 2.

3.2.3 Aboveground Hot Pipelines

3.2.3.1 General Requirements

All hot pipe lines above 16 degrees C, except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted, shall be insulated in accordance with Table 2. This includes but is not limited to the following:

a. Domestic hot water supply.

Insulation shall be covered, in accordance with manufacturer's recommendations, with a factory applied Type I jacket or field applied

aluminum where required or seal welded PVC.

3.2.4 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed in accordance with MLIT-M.

3.3 DUCT INSULATION SYSTEMS INSTALLATION

Install duct insulation systems in accordance with the approved plates as supplemented by the manufacturer's published installation instructions. Duct insulation minimum thickness and insulation level must be as listed in Table 3.

3.3.1 Duct Insulation Minimum Thickness

Duct insulation minimum thickness in accordance with Table 3.

| Table 3 - Minimum Duct Insulation (mm) | |
|---|---|
| Cold Air Ducts | 50 |
| Relief Ducts | 40 |
| Fresh Air Intake Ducts | 40 |
| Warm Air Ducts | 50 |
| Relief Ducts | 40 |
| Fresh Air Intake Ducts | 40 |

3.3.2 Insulation and Vapor Retarder/Vapor Barrier for Cold Air Duct

Insulation and vapor retarder/vapor barrier shall be provided for the following cold air ducts and associated equipment.

a. Supply ducts.

Fresh air intake ducts.

c. DOAS supply duct exposed on the roof.

3.3.3 Insulation for Warm Air Duct

Insulation and vapor barrier shall be provided for the following warm air ducts and associated equipment:

a. Supply ducts.

Fresh air intake ducts.

Ducts exposed to weather.

3.3.4 Ducts Handling Air for Dual Purpose

For air handling ducts for dual purpose below and above 16 degrees C, ducts shall be insulated as specified for cold air duct.

### 3.3.5 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket shall be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

### 3.3.6 Duct Exposed to Weather

#### 3.3.6.1 Installation

Ducts exposed to weather shall be insulated and finished as specified in accordance with MLIT-M.

## 3.4 EQUIPMENT INSULATION SYSTEMS INSTALLATION

### 3.4.1 Insulation for Hot Equipment

#### 3.4.1.1 Insulation

Hot water storage tank is provided with manufacturer's standard urethane foam insulation in accordance with JIS A 9511.

-- End of Section --

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SECTION 23 23 00

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**10/07**

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# SECTION 23 23 00

# REFRIGERANT PIPING
**10/07**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E84 | (2020) Standard Test Method for Surface Burning Characteristics of Building Materials |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS G 3302 | (2019) Hot Dip Zinc Coated Steel Sheet and Strip |
| JIS G 3454 | (2019) Carbon Steel Pipes for Pressure Service (Amendment 1) |
| JIS H 3300 | (2018) Copper and Copper Alloy Seamless Pipes and Tubes |
| JIS H 3401 | (2001) Pipe Fittings of Copper and Copper Alloys |
| JIS Z 3197 | (2012) Test Methods for Soldering Fluxes |
| JIS Z 3202 | (2007) Copper and Copper Alloy Gas Welding Rods |
| JIS Z 3284-1 | (2014) Solder Paste-Part 1: Kinds and Quality Classification |
| JIS Z 3801 | (2018) Standard Qualification Test and Acceptance Requirements for Manual Welding Technique |

MLIT MECHANICAL STANDARD SPECIFICATION

| | |
|---|---|
| MLIT-M | (2019) Public Building Construction Standard Specification |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Refrigerant Piping System; G

SD-06 Test Reports

Refrigerant Piping Tests

SD-10 Operation and Maintenance Data

Maintenance

## 1.3 QUALITY ASSURANCE

### 1.3.1 Qualifications

Submit 6 copies of qualified procedures, and list of names and identification symbols of qualified welders and welding operators, prior to non-factory welding operations. Piping shall be welded in accordance with the qualified procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with JIS Z 3801. Notify the Contracting Officer 24 hours in advance of tests to be performed at the work site, if practical. The welder or welding operator shall apply the personally assigned symbol near each weld made, as a permanent record.

### 1.3.2 Contract Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and arrange such work accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

## 1.4 DELIVERY, STORAGE, AND HANDLING

Protect stored items from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation is the Contractor's responsibility. Replace any materials found to be damaged at the Contractor's expense. During installation, cap piping and similar openings to keep out dirt and other foreign matter.

## 1.5 MAINTENANCE

### 1.5.1 General

Submit Data Package 2 plus operation and maintenance data complying with the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA and as specified herein.

# PART 2 PRODUCTS

## 2.1 STANDARD COMMERCIAL PRODUCTS

a. Provide materials and equipment which are standard products of a

manufacturer regularly engaged in the manufacturing of such products, that are of a similar material, design and workmanship and that have been in satisfactory commercial or industrial use for 2 years prior to bid opening.

b. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown.

c. Products shall be supported by a service organization location in Japan. System components shall be environmentally suitable for the indicated locations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. The service organizations shall be reasonably convenient to the equipment installation and be able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

d.. Manufacturer's standard catalog data, at least 5 weeks prior to the purchase or installation of a particular component, highlighted to show material, size, options, performance charts and curves, etc. in adequate detail to demonstrate compliance with contract requirements. Include in the data manufacturer's recommended installation instructions and procedures. Provide data for the following components as a minimum:

(1) Piping and Fittings
(2) Valves
(3) Piping Accessories
(4) Pipe Hangers, Inserts, and Supports

## 2.2 ELECTRICAL WORK

Electrical equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Field wiring shall be in accordance with manufacturer's instructions. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided.

## 2.3 REFRIGERANT PIPING SYSTEM

Refrigerant piping, valves, fittings, and accessories shall be in accordance with Japanese Refrigeration Safety Regulations (Nihon-Reitou-Hoan-Kisoku) for Japanese Standard., except as specified herein. Refrigerant piping, valves, fittings, and accessories shall be compatible with the fluids used and capable of withstanding the pressures and temperatures of the service. Refrigerant piping, valves, and accessories used for refrigerant service shall be cleaned, dehydrated, and sealed (capped or plugged) prior to shipment from the manufacturer's plant. Submit drawings, at least 3 weeks prior to beginning construction, provided in adequate detail to demonstrate compliance with contract requirements. Drawings shall consist of:

a. Piping layouts which identify all valves and fittings.

b. Plans and elevations which identify clearances required for maintenance and operation.

## 2.4 PIPE, FITTINGS AND END CONNECTIONS (JOINTS)

### 2.4.1 Copper Tubing

Copper tubing shall conform to JIS H 3300 and JIS H 3401, annealed or hard drawn as required. Copper tubing shall be soft annealed where bending is required and hard drawn where no bending is required. Soft annealed copper tubing shall not be used in sizes larger than 35 mm. Joints shall be brazed except that joints on lines 22 mmand smaller may be flared. Cast copper alloy fittings for flared copper tube shall conform to JIS H 3401. Wrought copper and bronze solder-joint pressure fittings shall conform to JIS H 3401. Joints and fittings for brazed joint shall be wrought-copper or forged-brass sweat fittings. Cast sweat-type joints and fittings shall not be allowed for brazed joints. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and to threaded ends of valves and equipment.

### 2.4.2 Solder

Solder shall conform to JIS Z 3284-1, tin-antimony alloy for service pressures up to 1034 kPa. Solder flux shall be liquid or paste form, non-corrosive and conform to JIS Z 3197.

### 2.4.3 Brazing Filler Metal

Filler metal shall conform to JIS Z 3202.

## 2.5 PIPING ACCESSORIES

### 2.5.1 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, guides, and supports shall conform to MLIT-M.

### 2.5.2 Escutcheons

Escutcheons shall be chromium-plated iron or chromium-plated brass, either one piece or split pattern, held in place by internal spring tension or set screws.

## 2.6 FABRICATION

### 2.6.1 Factory Applied Insulation

Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors shall have a flamespread index no higher than 75 and a smoke developed index no higher than 150. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E84.

# PART 3 EXECUTION

## 3.1 EXAMINATION

After becoming familiar with all details of the work, perform a verification of dimensions in the field. Submit a letter, at least 2 weeks prior to beginning construction, including the date the site was visited, conformation of existing conditions, and any discrepancies found before performing any work.

## 3.2 INSTALLATION

Pipe and fitting installation shall conform to the requirements of MLIT-M. Cut pipe accurately to measurements established at the jobsite, and work into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation are not permitted without written approval. Cut pipe or tubing square, removeremoved by reaming, and permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers.

### 3.2.1 Directional Changes

Make changes in direction with fittings, except that bending of pipe 100 mm and smalleris permitted, provided a pipe bender is used and wide weep bends are formed. Mitering or notching pipe or other similar construction to form elbows or tees is not permitted. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be accepted.

### 3.2.2 Functional Requirements

Piping shall be installed 4 mm/m of pipe in the direction of flow to ensure adequate oil drainage. Open ends of refrigerant lines or equipment shall be properly capped or plugged during installation to keep moisture, dirt, or other foreign material out of the system. Piping shall remain capped until installation. Equipment piping shall be in accordance with the equipment manufacturer's recommendations and the contract drawings. Equipment and piping arrangements shall fit into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance.

### 3.2.3 Fittings and End Connections

#### 3.2.3.1 Brazed Connections

Perform brazing in accordance with MLIT-M, except as modified herein. During brazing, fill the pipe and fittings with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, clean both the outside of the tube and the inside of the fitting with a wire fitting brush until the entire joint surface is bright and clean. Do not use brazing flux. Remove surplus brazing material at all joints. Make steel tubing joints in accordance with the manufacturer's recommendations. Paint joints in steel tubing with the same material as the baked-on coating within 8 hours after joints are made. Protect tubing against oxidation during brazing by continuous purging of the inside of the piping using nitrogen. Support piping prior to brazing and do not spring or force.

#### 3.2.3.2 Flared Connections

When flared connections are used, a suitable lubricant shall be used between the back of the flare and the nut in order to avoid tearing the flare while tightening the nut.

### 3.2.4 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports shall conform to MLIT-M, except as modified herein.

#### 3.2.4.1 Horizontal Pipe Supports

Horizontal pipe supports shall be spaced as specified in MLIT-M and a support shall be installed not over 300 mm from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 1.5 m apart at valves.

#### 3.2.4.2 Vertical Pipe Supports

Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 4.5 m not more than 2.4 m from end of risers, and at vent terminations.

#### 3.2.4.3 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

#### 3.2.4.4 Seismic Requirements

Piping and attached valves shall be supported and braced to resist seismic loads as specified under Building equipment seismic design & construction guidelines 2014 Edition.

#### 3.2.4.5 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Masonry anchors for overhead applications shall be constructed of ferrous materials only. Structural steel brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section.

### 3.2.5 Pipe Alignment Guides

Pipe alignment guides shall be provided where indicated for expansion loops, offsets, and bends and as recommended by the manufacturer for expansion joints, not to exceed 1.5 m on each side of each expansion joint, and in lines 100 mm or smaller not more than 600 mm on each side of the joint.

### 3.2.6 Pipe Anchors

Anchors shall be provided wherever necessary or indicated to localize

expansion or to prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results using turnbuckles where required. Supports, anchors, or stays shall not be attached where they will injure the structure or adjacent construction during installation or by the weight of expansion of the pipeline. Where pipe and conduit penetrations of vapor barrier sealed surfaces occur, these items shall be anchored immediately adjacent to each penetrated surface, to provide essentially zero movement within penetration seal. Detailed drawings of pipe anchors shall be submitted for approval before installation.

### 3.2.7 Building Surface Penetrations

Sleeves shall not be installed in structural members except where indicated or approved. Sleeves in nonload bearing surfaces shall be galvanized sheet metal, conforming to JIS G 3302, 1.0 mm (20 gauge). Sleeves in load bearing surfaces shall be uncoated carbon steel pipe, conforming to JIS G 3454. Sealants shall be applied to moisture and oil-free surfaces and elastomers to not less than 13 mm depth. Sleeves shall not be installed in structural members.

#### 3.2.7.1 General Service Areas

Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface. Pipes passing through concrete or masonry wall or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall be of such size as to provide a minimum of 6 mm all-around clearance between bare pipe and sleeves or between jacketed-insulation and sleeves. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over-insulation and sleeve shall be sealed in accordance with Section 07 92 00 JOINT SEALANTS section.

#### 3.2.7.2 Escutcheons

Finished surfaces where exposed piping, bare or insulated, pass through floors, walls, or ceilings, except in boiler, utility, or equipment rooms, shall be provided with escutcheons. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheon shall be secured to pipe or pipe covering.

### 3.2.8 Access Panels

Access panels shall be provided for all concealed valves, vents, controls, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 08 31 00 ACCESS DOORS AND PANELS.

### 3.2.9 Field Applied Insulation

Field installed insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS, except as defined differently herein.

### 3.2.10 Identification Tags

Provide identification tags made of brass, engraved laminated plastic or engraved anodized aluminum indicating service and item number on all valves and dampers. Tags shall be 35 mm minimum diameter and marking shall be stamped or engraved. Indentations shall be black for reading clarity. Tags shall be attached to valves with No. 12 AWG copper wire, chrome-plated beaded chain or plastic straps designed for that purpose.

## 3.3 CLEANING AND ADJUSTING

Clean uncontaminated system(s) by evacuation and purging procedures currently recommended by refrigerant and refrigerant equipment manufacturers, and as specified herein, to remove small amounts of air and moisture. Systems containing moderate amounts of air, moisture, contaminated refrigerant, or any foreign matter shall be considered contaminated systems. Restoring contaminated systems to clean condition including disassembly, component replacement, evacuation, flushing, purging, and re-charging, shall be performed using currently approved refrigerant and refrigeration manufacturer's procedures. Restoring contaminated systems shall be at no additional cost to the Government as determined by the Contracting Officer. Water shall not be used in any procedure or test.

## 3.4 REFRIGERANT PIPING TESTS

After all components of the refrigerant system have been installed and connected, subject the entire refrigeration system to pneumatic, evacuation, and startup tests as described herein. Submit a schedule, at least 2 weeks prior to the start of related testing, for each test. Identify the proposed date, time, and location for each test. Conduct tests in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Provide all material, equipment, instruments, and personnel required for the test. Provide the services of a qualified technician, as required, to perform all tests and procedures indicated herein. Field tests shall be coordinated with Section 23 05 93 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Submit 6 copies of the tests report in bound 216 by 279 mm booklets documenting all phases of the tests performed. The report shall include initial test summaries, all repairs/adjustments made, and the final test results.

### 3.4.1 Preliminary Procedures

Prior to pneumatic testing, equipment which has been factory tested and refrigerant charged as well as equipment which could be damaged or cause personnel injury by imposed test pressure, positive or negative, shall be isolated from the test pressure or removed from the system. Safety relief valves and rupture discs, where not part of factory sealed systems, shall be removed and openings capped or plugged.

### 3.4.2 Pneumatic Test

Pressure control and excess pressure protection shall be provided at the source of test pressure. Valves shall be wide open, except those leading to the atmosphere. Test gas shall be dry nitrogen, with minus 55 degrees C dewpoint and less than 5 ppm oil. Test pressure shall be applied in two stages before any refrigerant pipe is insulated or covered. First stage test shall be at 69 kPa with every joint being tested with a thick soap or

color indicating solution. Second stage tests shall raise the system to the minimum refrigerant leakage test pressure, with a maximum test pressure 25 percent greater. Pressure above 690 KPa shall be raised in 10 percent increments with a pressure acclimatizing period between increments. The initial test pressure shall be recorded along with the ambient temperature to which the system is exposed. Final test pressures of the second stage shall be maintained on the system for a minimum of 24 hours. At the end of the 24 hour period, the system pressure will be recorded along with the ambient temperature to which the system is exposed. A correction factor of 2 kPa will be allowed for each degree C change between test space initial and final ambient temperature, plus for increase and minus for a decrease. If the corrected system pressure is not exactly equal to the initial system test pressure, then the system shall be investigated for leaking joints. To repair leaks, the joint shall be taken apart, thoroughly cleaned, and reconstructed as a new joint. Joints repaired by caulking, remelting, or back-welding/brazing shall not be acceptable. Following repair, the entire system shall be retested using the pneumatic tests described above. The entire system shall be reassembled once the pneumatic tests are satisfactorily completed.

### 3.4.3 Evacuation Test

Following satisfactory completion of the pneumatic tests, the pressure shall be relieved and the entire system shall be evacuated to an absolute pressure of 300 micrometers. During evacuation of the system, the ambient temperature shall be higher than 2 degrees C. No more than one system shall be evacuated at one time by one vacuum pump. Once the desired vacuum has been reached, the vacuum line shall be closed and the system shall stand for 1 hour. If the pressure rises over 500 micrometers after the 1 hour period, then the system shall be evacuated again down to 300 micrometers and let set for another 1 hour period. The system shall not be charged until a vacuum of at least 500 micrometers is maintained for a period of 1 hour without the assistance of a vacuum line. If during the testing the pressure continues to rise, check the system for leaks, repair as required, and repeat the evacuation procedure. During evacuation, pressures shall be recorded by a thermocouple-type, electronic-type, or a calibrated-micrometer type gauge.

### 3.4.4 System Charging and Startup Test

Following satisfactory completion of the evacuation tests, the system shall be charged with the required amount of refrigerant by raising pressure to normal operating pressure and in accordance with manufacturer's procedures. Following charging, the system shall operate with high-side and low-side pressures and corresponding refrigerant temperatures, at design or improved values. The entire system shall be tested for leaks.

### 3.4.5 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system shall immediately be isolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. Under no circumstances shall the refrigerant be discharged into the atmosphere.

### 3.4.6 Contractor's Responsibility

At all times during the installation and testing of the refrigeration

system, take steps to prevent the release of refrigerants into the atmosphere. The steps shall include, but not be limited to, procedures which will minimize the release of refrigerants to the atmosphere and the use of refrigerant recovery devices to remove refrigerant from the system and store the refrigerant for reuse or reclaim. At no time shall more than 85 g of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year shall be repaired in accordance with the requirements herein at no cost to the Government including material, labor, and refrigerant if the leak is the result of defective equipment, material, or installation.

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# SECTION 23 30 00

# HVAC AIR DISTRIBUTION
**05/20**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

| | |
|---|---|
| AMCA 210 | (2016) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating |
| AMCA 300 | (2024) Reverberation Room Methods of Sound Testing of Fans |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 90A | (2021) Standard for the Installation of Air Conditioning and Ventilating Systems |

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

| | |
|---|---|
| SMACNA 1819 | (2002) Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, 5th Edition |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 555 | (2006; Reprint Aug 2016) UL Standard for Safety Fire Dampers |
| UL 705 | (2017; Reprint Oct 2018) UL Standard for Safety Power Ventilators |
| UL Electrical Construction | (2012) Electrical Construction Equipment Directory |
| UL Fire Resistance | (2014) Fire Resistance Directory |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 4009 | (2017) Components of Air Duct |
| JIS A 9504 | (2021) Man Made Mineral Fibre Thermal Insulation Materials |
| JIS B 1518 | (2013) Rolling Bearings-Dynamic Load Ratings and Rating Life |

| | |
|---|---|
| JIS B 1521 | (2012) Rolling Bearings-Deep Groove Ball Bearings |
| JIS B 1534 | (2013) Rolling Bearings-Tapered Roller Bearings |
| JIS B 8330 | (2000) Testing Methods for Turbo-Fans |
| JIS B 8615-1 | (2013) Non-ducted Air Conditioners and Heat Pumps-Testing and Rating for Performance |
| JIS B 8616 | (2015) Package Air Conditioners |
| JIS C 4203 | (2010) Single Phase Induction Motors for General Purpose (Amendment 1) |
| JIS C 4212 | (2010) Low-Voltage Three-Phase Squirrel-Cage High-Efficiency Induction Motors (Amendment 1) |
| JIS C 9603 | (1988) Ventilating Fans |
| JIS G 3302 | (2019) Hot Dip Zinc Coated Steel Sheet and Strip |
| JIS G 3452 | (2016) Carbon Steel Pipes for Ordinary Piping (Amendment 1) |
| JIS G 3553 | (2011) Crimped Wire Cloth (Amendment 1) |
| JIS H 8610 | (1999) Electroplated-Coatings of Zinc on Iron or Steel |
| JIS H 8641 | (2007) Hot Dip Galvanized Coatings |
| JIS HB 71 | (2019) Electrical Safety |
| JIS K 5600-5-5 | (1999) Testing Methods for Paints- Part 5 : Mechanical Property of Film Section 5 : Scratch Hardness (Stylus Method) |
| JIS K 5600-5-6 | (1999) Testing Methods for Paints - Part 5 : Mechanical Property of Film-Section 6 : Adhesion Test (Cross-Cut Test) |
| JIS K 5600-7-9 | (2006) Testing Methods for Paints Part 7 : Determination Of Resistance to Cyclic Corrosion Conditions Section 9 : Salt Fog/Dry/Humidity |
| JIS Z 2330 | (2012) Non-Destructive Testing-Selection of Leak Testing Method |
| JIS Z 2371 | (2015) Methods of Salt Spray Testing |

MLIT MECHANICAL STANDARD SPECIFICATION

| | |
|---|---|
| MLIT-M | (2019) Public Building Construction |

Standard Specification

JBE-S (2014) Japanese Building Equipment Seismic Standard Design

## 1.2 SYSTEM DESCRIPTION

Furnish ductwork, piping offsets, fittings, and accessories as required to provide a complete installation. Coordinate the work of the different trades to avoid interference between piping, equipment, structural, and electrical work. Provide complete, in place, all necessary offsets in piping and ductwork, and all fittings, and other components, required to install the work as indicated and specified.

### 1.2.1 Mechanical Equipment Identification

The number of charts and diagrams must be equal to or greater than the number of mechanical equipment rooms. Where more than one chart or diagram per space is required, mount these in edge pivoted, swinging leaf, extruded aluminum frame holders which open to 170 degrees.

#### 1.2.1.1 Charts

Provide chart listing of equipment by designation numbers and capacities such as flow rates, pressure and temperature differences, heating and cooling capacities, horsepower, pipe sizes, and voltage and current characteristics.

#### 1.2.1.2 Diagrams

Submit proposed diagrams, at least 2 weeks prior to start of related testing. provide neat mechanical drawings provided with extruded aluminum frame under 3 mm glass or laminated plastic, system diagrams that show the layout of equipment, piping, and ductwork, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system. After approval, post these items where directed.

### 1.2.2 Service Labeling

Label equipment, including fans, air handlers, terminal units, etc. with labels made of self-sticking, plastic film designed for permanent installation. Provide labels in accordance with the typical examples below:

| SERVICE | LABEL AND TAG DESIGNATION |
|---|---|
| Exhaust Fan Number | EF - |

Identify similar services with different temperatures or pressures. Where pressures could exceed 860 kilopascal, include the maximum system pressure in the label. Label and arrow piping in accordance with the following:

a. Each point of entry and exit of pipe passing through walls.

b. Each change in direction, i.e., elbows, tees.

c. In congested or hidden areas and at all access panels at each point required to clarify service or indicated hazard.

d. In long straight runs, locate labels at distances within eyesight of each other not to exceed 22 meter. All labels must be visible and legible from the primary service and operating area.

### 1.2.3 Color Coding

Color coding of all piping systems must be in accordance with MLIT-M or the base standard.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Metallic Flexible Duct

General Service Duct Connectors

Fire Dampers

Centrifugal Fans

Range Hood

Ceiling Exhaust Fans

Dedicated Outside Air System (DOAS)

Test Procedures

Diagrams; G

SD-06 Test Reports

Performance Tests

Damper Acceptance Test; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals

Fire Dampers

Dedicated Outside Air System (DOAS)

Manual Balancing Dampers

Centrifugal Fans

Ceiling Exhaust Fans

Range Hood

## 1.4 QUALITY ASSURANCE

Except as otherwise specified, approval of materials and equipment is based on manufacturer's published data.

a. Submit a written certificate from any recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the specified requirements. Outline methods of testing used by the specified agencies.

b. Where materials or equipment are specified to be constructed or tested, or both, in accordance with the standards of the JIS a manufacturer's certificate of compliance of each item is acceptable as proof of compliance.

c. Conformance to such agency requirements does not relieve the item from compliance with other requirements of these specifications.

### 1.4.1 Prevention of Corrosion

Protect metallic materials against corrosion. Provide rust-inhibiting treatment and standard finish for the equipment enclosures. Do not use aluminum in contact with earth, and where connected to dissimilar metal. Protect aluminum by approved fittings, barrier material, or treatment. Provide hot-dip galvanized ferrous parts such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials in accordance with JIS H 8641 for exterior locations and cadmium-plated in conformance with JIS H 8610 for interior locations. Provide written certification from the bolt manufacturer that the bolts furnished comply with the requirements of this specification. Include illustrations of product markings, and the number of each type of bolt to be furnished in the certification.

### 1.4.2 Asbestos Prohibition

Do not use asbestos and asbestos-containing products.

### 1.4.3 Detail Drawings

Submit detail drawings showing equipment layout, including assembly and installation details and electrical connection diagrams; ductwork layout showing the location of all supports and hangers, typical hanger details, gauge reinforcement, reinforcement spacing rigidity classification, and static pressure and seal classifications. Include any information required to demonstrate that the system has been coordinated and functions properly as a unit on the drawings and show equipment relationship to other parts of the work, including clearances required for operation and maintenance. Submit drawings showing bolt-setting information, and foundation bolts prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Submit function designation of the equipment and any other requirements specified

throughout this Section with the shop drawings.

1.4.4 Test Procedures

Submit proposed test procedures and test schedules for the ductwork leak test, and performance tests of systems, at least 2 weeks prior to the start of related testing.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect stored equipment at the jobsite from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, cap or plug all pipes until installed.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide components and equipment that are "standard products" of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. "Standard products" is defined as being in satisfactory commercial or industrial use for 2 years before bid opening, including applications of components and equipment under similar circumstances and of similar size, satisfactorily completed by a product that is sold on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record are acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Provide equipment items that are supported by a service organization located in Japan.

2.2 IDENTIFICATION PLATES

In addition to standard manufacturer's Identification plates shall be manufacturer's standard product.Plates provide engraved laminated phenolic identification plates for each piece of mechanical equipment. Identification plates are to designate the function of the equipment. Submit designation with the shop drawings. Provide identification plates that are layers, black-white-black, engraved to show white letters on black background. Letters must be upper case. Identification plates 40 mm that are high and smaller must be 1.6 mm thick, with engraved lettering 3 mm high; identification plates larger than 40 mm high must be 3 mm thick, with engraved lettering of suitable height. Identification plates 40 mm high and larger must have beveled edges. Install identification plates using a compatible adhesive.

2.3 EQUIPMENT GUARDS AND ACCESS

Fully enclose or guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact according to OSHA requirements. Properly guard or cover with insulation of a type specified, high temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard.

2.4 ELECTRICAL WORK

a. Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers

indicated as part of motor control centers. Provide electrical equipment, including motors and wiring, as specified in Section 26 20 00INTERIOR DISTRIBUTION SYSTEM. Provide manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown. For packaged equipment, include manufacturer provided controllers with the required monitors and timed restart.

b. For single-phase motors, provide high-efficiency type, fractional-horsepower alternating-current motors, including motors that are part of a system, in accordance with JIS C 4203.

c. For polyphase motors, provide squirrel-cage medium induction motors, including motors that are part of a system , and that meet the efficiency ratings for premium efficiency motors in accordance with JIS C 4212.

d. Provide motors in accordance with JIS C 4212 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor. Provide motors rated for continuous duty with the enclosure specified. Provide motor duty that allows for maximum frequency start-stop operation and minimum encountered interval between start and stop. Provide motor torque capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload protection and other necessary appurtenances. Fit motor bearings with grease supply fittings and grease relief to outside of the enclosure.

## 2.5 ANCHOR BOLTS

Provide anchor bolts for equipment placed on concrete equipment pads or on concrete slabs. Bolts to be of the size and number recommended by the equipment manufacturer and located by means of suitable templates. Installation of anchor bolts must not degrade the surrounding concrete.

## 2.6 SEISMIC ANCHORAGE

Anchor equipment in accordance with applicable seismic criteria for the area and as defined in JBE-S

## 2.7 PAINTING

Paint equipment units in accordance with approved equipment manufacturer's standards unless specified otherwise. Field retouch only if approved. Otherwise, return equipment to the factory for refinishing.

## 2.8 DUCT SYSTEMS

### 2.8.1 Metal Ductwork

Provide metal ductwork construction, including all fittings and components, that complies with MLIT-M.

#### 2.8.1.1 Metallic Flexible Duct

a. Provide duct that conforms to MLIT-M with factory-applied insulation, vapor barrier, and end connections. Provide ducts designed for

working pressures of 497 Pa and 373 Pa. Provide flexible round duct length that does not exceed 1525 mm. Secure connections by applying adhesive for 51 mm over rigid duct, apply flexible duct 51 mm over rigid duct, apply metal clamp, and provide minimum of three No. 8 sheet metal screws through clamp and rigid duct.

b. Inner duct core: Provide interlocking spiral or helically corrugated flexible core constructed of zinc-coated steel, aluminum, or stainless steel; or constructed of inner liner of continuous galvanized spring steel wire helix fused to continuous, fire-retardant, flexible vapor barrier film, inner duct core.

c. Insulation: Provide inner duct core that is insulated with mineral fiber blanket type flexible insulation, minimum of 25 mm thick. Provide insulation covered on exterior with manufacturer's standard fire retardant vapor barrier jacket for flexible round duct.

#### 2.8.1.2 General Service Duct Connectors

Provide a flexible duct connector approximately 150 mm in width where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, secure the flexible material by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, install the flexible material locked to metal collars using normal duct construction methods.

### 2.8.2 Duct Access Doors

Provide hinged access doors conforming to MLIT-M in ductwork and plenums where indicated and at all air flow measuring primaries, automatic dampers, fire dampers, coils, thermostats, and other apparatus requiring service and inspection in the duct system. Provide access doors upstream and downstream of air flow measuring primaries and heating and cooling coils. Provide doors that are a minimum 375 by 450 mm, unless otherwise shown. Where duct size does not accommodate this size door, make the doors as large as practicable. Equip doors 600 by 600 mm or larger with fasteners operable from inside and outside the duct. Use insulated type doors in insulated ducts.

### 2.8.3 Removable Duct Section

Dampers equipped with fusible links, internal operators, or both shall be provided with an access door that is not less than 12 in square or provided with a removable duct section in accordance with NFPA 90A. Removable duct section shall be in accordance with the manufacturer's standard or have a structure that meets the NFPA 90A requirement.

### 2.8.4 Fire Dampers

Use 1.5 hour rated fire dampers unless otherwise indicated. Provide fire dampers that conform to the requirements of NFPA 90A and UL 555. Perform the fire damper test as outlined in NFPA 90A. Provide automatic operating fire dampers with a dynamic rating suitable for the maximum air velocity and pressure differential to which it is subjected. Provide fire dampers approved for the specific application, and install according to their listing. Equip fire dampers with a steel sleeve or adequately sized frame installed in such a manner that disruption of the attached ductwork, if any, does not impair the operation of the damper. Equip sleeves or frames with perimeter mounting angles attached on both sides of the wall

or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce the ceiling of the assemblies in conformance with UL Fire Resistance. Provide in the air stream single blade type fire dampers. Install dampers that do not reduce the duct or the air transfer opening cross-sectional area. Install dampers so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition or floor slab depth or thickness. Unless otherwise indicated, comply with the installation details given in SMACNA 1819 and in manufacturer's instructions for fire dampers. Perform acceptance testing of fire dampers according to paragraph Fire Damper Acceptance Test and NFPA 90A.

2.8.5 Manual Balancing Dampers

Furnish manual balancing dampers with accessible operating mechanisms. Use chromium plated operators (with all exposed edges rounded) in finished portions of the building. Provide manual volume control dampers that are operated by locking-type quadrant operators.Install dampers that are 2 gauges heavier than the duct in which installed. Unless otherwise indicated, provide opposed blade type multileaf dampers with maximum blade width of 300 mm. Provide access doors or panels for all concealed damper operators and locking setscrews. Provide stand-off mounting brackets, bases, or adapters not less than the thickness of the insulation when the locking-type quadrant operators for dampers are installed on ducts to be thermally insulated, to provide clearance between the duct surface and the operator. Provide stand-off mounting items that are integral with the operator or standard accessory of the damper manufacturer.

2.8.6 Automatic Motorized Dampers

2.8.6.1 DAMPERS

2.8.6.1.1 Damper Assembly

Provide single damper sections with blades no longer than 1.2 m 48 inches and which are no higher than 1.8 m 72 inches and damper blade width of 203 mm 8 inches or less. When larger sizes are required, combine damper sections. Provide dampers made of steel, or other materials where indicated and with assembly frames constructed of 2.8 mm 0.07 inch minimum thickness stainless steel channels with mitered and welded corners. Steel channel frames constructed of 1.5 mm 0.06 inch minimum thickness are acceptable provided the corners are reinforced.

a. Flat blades must be made rigid by folding the edges. Blade-operating linkages must be within the frame so that blade-connecting devices within the same damper section must not be located directly in the air stream.

b. Damper axles must be 13 mm 1/2 inch minimum, plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically must be supported by thrust bearings.

c. Provide dampers which do not exceed a pressure drop through the damper of 10 Pa 0.04 inches water gauge at 5 m/s 1000 ft/min in the wide-open position. Provide dampers with frames not less than 50 mm 2 inch in width. Provide dampers which have been tested in accordance with AMCA 500-D.

2.8.6.1.2 Operating Linkages

For operating links external to dampers, such as crank arms, connecting rods, and line shafting for transmitting motion from damper actuators to dampers, provide links able to withstand a load equal to at least 300 percent of the maximum required damper-operating force without deforming. Rod lengths must be adjustable. Links must be brass, bronze, zinc-coated steel, or stainless steel. Working parts of joints and clevises must be brass, bronze, or stainless steel. Adjustments of crank arms must control the open and closed positions of dampers.

2.8.6.1.3 Damper Types

**********
NOTE: As of July 2009, UFC 4-010-01 requires a maximum OA damper leakage of 15 L/s per square meter at 249 Pa 3 cfm per square foot at 1 iwc static, which is a Class 1A damper. If this UFC or a similar requirement for a low-leakage damper is applicable to the project select Class 1A.
Otherwise:
1) If the application is in a very cold climate or where the system runs continuously consider selecting Class 1.
2) In other flow control applications select Class 2
For reference only, AMCA 511 leakage classifications at 1017 Pa 4 iwc static are:
Class 1A: N/A.
Class 1: 41 L/s per square meter 8 cfm per square foot of damper area.
Class 2: 102 L/s per square meter 20 cfm per square foot of damper area.
Class 3: 406 L/s per square meter 80 cfm per square foot of damper area.
AMCA 511 leakage classifications at 256 Pa 1 iwc static are:
Class 1A: 15 L/s per square meter 3 cfm per square foot of damper area.
Class 1: 20 L/s per square meter 4 cfm per square foot of damper area.
**********

2.8.6.2 Flow Control Dampers

Provide parallel-blade or opposed blade type dampers for outside air, return air, relief air, exhaust, face and bypass dampers as indicated onthe Damper Schedule. Blades must have interlocking edges. The channel frames of the dampers must be provided with jamb seals to minimize air leakage. Unless otherwise indicated, dampers must meet AMCA 511 Class 1 requirements. Outside air damper seals must be suitable for an operating temperature range of -40 to +75 degrees C -40 to +167 degrees F. Dampers must be rated at not less than 10 m/s 2000 ft/min air velocity.

2.8.6.3 Mechanical Rooms and Other Utility Space Ventilation Dampers

Provide utility space ventilation dampers as indicated. Unless otherwise indicated provide AMCA 511 class 3 dampers. Provide dampers rated at not less than 7.6 m/s 1500 ft/min air velocity.

### 2.8.7 Air Supply And Exhaust Air Dampers

Provide outdoor air supply and exhaust air dampers that have a maximum leakage rate when tested in accordance with JIS A 4009 as required by MLIT-M,

### 2.8.8 Air Deflectors (Volume Extractors) and Branch Connections

Provide air deflectors (volume extractors) at all duct mounted supply outlets, at takeoff or extension collars to supply outlets, at duct branch takeoff connections, and at 90 degree elbows, as well as at locations as indicated on the drawings or otherwise specified. Conical branch connections or 45 degree entry connections are allowed in lieu of deflectors for branch connections. Furnish all air deflectors (volume extractors), except those installed in 90 degree elbows, with an approved means of adjustment. Provide easily accessible means for adjustment inside the duct or from an adjustment with sturdy lock on the face of the duct. When installed on ducts to be thermally insulated, provide external adjustments with stand-off mounting brackets, integral with the adjustment device, to provide clearance between the duct surface and the adjustment device not less than the thickness of the thermal insulation. Provide factory-fabricated air deflectors consisting of curved turning vanes or louver blades designed to provide uniform air distribution and change of direction with minimum turbulence or pressure loss. Provide factory or field assembled air deflectors (volume extractors). Make adjustment from the face of the diffuser or by position adjustment and lock external to the duct. Provide stand-off brackets on insulated ducts as described herein. Provide fixed air deflectors (volume extractors), also called turning vanes, in 90 degree elbows.

### 2.8.9 Diffusers, Registers, and Grilles

Provide factory-fabricated units of corrosion-resistant steel that distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 0.25 m/s in occupied zone, or dead spots anywhere in the conditioned area. Provide outlets for diffusion, spread, throw, and noise level as required for specified performance. Certify performance according to Japanese Industry Standards (JIS). Provide sound rated and certified inlets and outlets according to MLIT-M. Provide sound power level as indicated. Provide diffusers and registers with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device is acceptable. Provide opposed blade type volume dampers for all diffusers and registers, except linear slot diffusers. Provide linear slot diffusers with round or elliptical balancing dampers. Where the inlet and outlet openings are located less than 2 m above the floor, protect them by a grille or screen.

#### 2.8.9.1 Diffusers

Provide diffuser types indicated. Furnish ceiling mounted units with anti-smudge devices, unless the diffuser unit minimizes ceiling smudging through design features. Provide diffusers with air deflectors of the type indicated. Provide air handling troffers or combination light and ceiling diffusers conforming to the requirements of UL Electrical Construction for the interchangeable use as cooled or heated air supply diffusers or return air units. Install ceiling mounted units with rims tight against ceiling. Provide sponge rubber gaskets between ceiling and surface mounted diffusers for air leakage control. Provide

suitable trim for flush mounted diffusers. For connecting the duct to diffuser, provide duct collar that is airtight and does not interfere with volume controller. Provide return or exhaust units that are similar to supply diffusers.

2.8.9.2 Registers and Grilles

Provide units that are four-way directional-control type, except provide return and exhaust registers that are fixed horizontal or vertical louver type similar in appearance to the supply register face. Furnish registers with sponge-rubber gasket between flanges and wall or ceiling. Install wall supply registers at least 150 mm below the ceiling unless otherwise indicated. Locate return and exhaust registers 150 mm above the floor unless otherwise indicated. Achieve four-way directional control by a grille face which can be rotated in 4 positions or by adjustment of horizontal and vertical vanes. Provide grilles as specified for registers, without volume control damper.

2.8.10 Louvers

Provide louvers for installation in exterior walls that are associated with the air supply and distribution system as specified in the drawings.

2.8.11 Air Vents

Fabricate air vents from galvanized steel or aluminum sheets with galvanized or aluminum structural shapes. Provide sheet metal thickness, reinforcement, and fabrication that conform to MLIT-M. Accurately fit and secure louver blades to frames. Fold or bead edges of louver blades for rigidity and baffle these edges to exclude driving rain. Provide air vents with bird screen.

2.8.12 Insect Screens and Frames

Provide inect screens that conform to JIS G 3553, No. 10 mesh, aluminum or stainless steel. Provide "medium-light" rated aluminum screens. Provide "light" rated stainless steel screens. Provide removable type frames fabricated from either stainless steel or extruded aluminum.

2.9 AIR SYSTEMS EQUIPMENT

2.9.1 Fans

Test and rate fans according to JIS B 8330 or AMCA 210. Install air moving devices to minimize fan system effect. Where system effect is unavoidable, determine the most effective way to accommodate the inefficiencies caused by system effect on the installed air moving device. The sound power level of the fans must not exceed 85 dBA when tested according to JIS B 8330 or AMCA 300 and rated in accordance with JIS B 8330 or AMCA 300. Connect fans to the motors either directly or indirectly with V-belt drive. When fixed pitch sheaves are furnished, provide a replaceable sheave when needed to achieve system air balance. Provide fan and motor assemblies with vibration-isolation supports or mountings as indicated. Use vibration-isolation units that are standard products with published loading ratings. Select each fan to produce the capacity required at the fan static pressure indicated. Provide sound power level as indicated. Obtain the sound power level values according to JIS B 8330 or AMCA 300. Provide standard JIS C 9603 or UL 705, arrangement, rotation, and discharge as indicated.

#### 2.9.1.1 Centrifugal Fans

Provide fully enclosed, single-width single-inlet, or double-width double-inlet centrifugal fans, with JIS B 8330 or AMCA 300 as required or indicated for the design system pressure. Provide impeller wheels that are rigidly constructed and accurately balanced both statically and dynamically. Provide forward curved or backward-inclined airfoil design fan blades in wheel sizes up to 750 mm. Provide backward-inclined airfoil design fan blades for wheels over 750 mm in diameter. Provide centrifugal in line type booster fans for exhaust dryer systems, and fans suitable for conveying lint and the temperatures encountered. Equip the fan shaft with a heat slinger to dissipate heat buildup along the shaft. Install an access (service) door to facilitate maintenance to these fans. Provide L50 rated bearing life at not less than the requirement of JIS B 1518 as defined by JIS B 1521 and JIS B 1534 or US equivalent. Provide fan outlets of ample proportions, designed for the attachment of angles and bolts for attaching flexible connections. Provide automatically operated inlet vanes on suction inlets. Provide automatically operated outlet dampers. Unless otherwise indicated, provide motors that do not exceed 1800 rpm and have totally enclosed enclosures. Provide magnetic reduced-voltage-start type motor starters with weather-resistant enclosure. Provide remote manual switch with pilot indicating light where indicated.

#### 2.9.1.2 Ceiling Exhaust Fans

Provide centrifugal type, direct driven suspended cabinet-type ceiling exhaust fans. Provide fans with acoustically insulated housing. Provide chatter-proof backdraft damper. Provide egg-crate design or louver design integral face grille. Mount fan motors on vibration isolators. Furnish unit with mounting flange for hanging unit from above.

#### 2.9.1.3 Range Hood

Built-in vented range hood with lamp, centrifugal blower, permanent washable grease filter, back draft damper, vertical, 150 mm round duct connection and push button electronic controls with wound timer. UL or JIS listed. The air volume can be adjusted in 3 steps with the operation switch.

#### 2.9.1.4 Dedicated Outside Air System (DOAS)

DOAS Unit is a Factory Assembled unit, complete with accessories, wiring, piping and controls. DOAS Unit is provided with outlet grilles, and air filters as specified in the paragraph FILTERS. DOAS Unit is a packaged unit with heat pump to provide heating and cooling. Base ratings on the use of matched assemblies. Units shall have a minimum EER of 12 when tested in accordance with JIS B 8616 or JIS B 8615-1 as applicable. Provide capacity, electrical characteristics and operating conditions as indicated. Condensers shall provide not less than 10 degrees F liquid subcooling at standard ratings.

## 2.10 FACTORY PAINTING

Factory paint new equipment, which are not of galvanized construction. Paint with a corrosion resisting paint finish according to JIS H 8641 or JIS G 3302. Clean, phosphatize and coat internal and external ferrous metal surfaces with a paint finish which has been tested according to JIS Z 2371 JIS K 5600-7-9, and JIS K 5600-5-5 or JIS K 5600-5-6. Submit

evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors. Provide rating of failure at the scribe mark that is not less than 6, average creepage not greater than 3 mm. Provide rating of the inscribed area that is not less than 10, no failure. On units constructed of galvanized steel that have been welded, provide a final shop docket of zinc-rich protective paint on exterior surfaces of welds or welds that have burned through from the interior according to JIS H 8641.

Field paint factory painting that has been damaged prior to acceptance by the Contracting Officer in compliance with the requirements of paragraph FIELD PAINTING OF MECHANICAL EQUIPMENT.

## 2.11 SUPPLEMENTAL COMPONENTS/SERVICES

### 2.11.1 Refrigerant Piping

The requirements for refrigerant piping are specified in Section 23 23 00 REFRIGERANT PIPING.

### 2.11.2 Condensate Drain Lines

Provide and install condensate drainage for each item of equipment that generates condensate in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

### 2.11.3 Insulation

The requirements for shop and field applied insulation are specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

# PART 3 EXECUTION

## 3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

## 3.2 INSTALLATION

a. Install materials and equipment in accordance with the requirements of the contract drawings and approved manufacturer's installation instructions. Accomplish installation by workers skilled in this type of work. Perform installation so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors.b. No installation is permitted to block or otherwise impede access to any existing machine or system. Install all hinged doors to swing open a minimum of 120 degrees. Provide an area in front of all access doors that clears a minimum of 910 mm. In front of all access doors to electrical circuits, clear the area the minimum distance to energized circuits JIS HB 71 (Electrical-Safety Related work practices)and an additional 910 mm.

b. Except as otherwise indicated, install emergency switches and alarms in conspicuous locations. Mount all indicators, to include gauges, meters, and alarms in order to be easily visible by people in the area.

### 3.2.1 Condensate Drain Lines

Provide water seals in the condensate drain from all units. Provide a depth of each seal of 50 mm plus 0.1 mm for each Pa, of the total static pressure rating of the unit to which the drain is connected. Provide water seals that are constructed of 2 tees and an appropriate U-bend with the open end of each tee plugged. Provide pipe cap or plug cleanouts where indicated. Connect drains indicated to connect to the sanitary waste system using an indirect waste fitting. Insulate air conditioner drain lines as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

### 3.2.2 Equipment and Installation

Provide frames and supports for tanks, compressors, pumps, valves, air handling units, fans, coils, dampers, and other similar items requiring supports. Floor mount or ceiling hang air handling units as indicated. Anchor and fasten as detailed. Set floor-mounted equipment on not less than 150 mm concrete pads or curbs doweled in place unless otherwise indicated. Make concrete foundations heavy enough to minimize the intensity of the vibrations transmitted to the piping, duct work and the surrounding structure, as recommended in writing by the equipment manufacturer. In lieu of a concrete pad foundation, build a concrete pedestal block with isolators placed between the pedestal block and the floor. Make the concrete foundation or concrete pedestal block a mass not less than three times the weight of the components to be supported. Provide the lines connected to the pump mounted on pedestal blocks with flexible connectors. Submit foundation drawings as specified in paragraph DETAIL DRAWINGS. Provide concrete for foundations as specified in Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE.

### 3.2.3 Access Panels

Install access panels for concealed valves, vents, controls, dampers, and items requiring inspection or maintenance of sufficient size, and locate them so that the concealed items are easily serviced and maintained or completely removed and replaced. Provide access panels as specified in Section 08 31 00 ACCESS DOORS AND PANELS.

### 3.2.4 Flexible Duct

Install pre-insulated flexible duct in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Provide hangers, when required to suspend the duct, of the type recommended by the duct manufacturer and set at the intervals recommended.

### 3.2.5 Metal Ductwork

Install according to MLIT-M unless otherwise indicated. Install duct supports for sheet metal ductwork according to MLIT-M, unless otherwise specified. Do not use friction beam clamps indicated in MLIT-M. Anchor risers on high velocity ducts in the center of the vertical run to allow ends of riser to move due to thermal expansion. Erect supports on the risers that allow free vertical movement of the duct. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C-clamps are used, provide retainer

clips.

### 3.2.6 Insulation

Provide thickness and application of insulation materials for ductwork, piping, and equipment according to Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Externally insulate outdoor air intake ducts and plenums up to the point where the outdoor air reaches the conditioning unit or up to the point where the outdoor air mixes with the return air stream.

### 3.2.7 Duct Test Holes

Provide holes with closures or threaded holes with plugs in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Plug insulated duct at the duct surface, patched over with insulation and then marked to indicate location of test hole if needed for future use.

### 3.2.8 Power Transmission Components Adjustment

Test V-belts and sheaves for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Uniformly load belts on drive side to prevent bouncing. Make alignment of direct driven couplings to within 50 percent of manufacturer's maximum allowable range of misalignment.

## 3.3 EQUIPMENT PADS

Provide equipment pads to the dimensions shown or, if not shown, to conform to the shape of each piece of equipment served with a minimum 75 mm margin around the equipment and supports. Allow equipment bases and foundations, when constructed of concrete or grout, to cure a minimum of 28 calendar days before being loaded.

## 3.4 CUTTING AND PATCHING

Install work in such a manner and at such time that a minimum of cutting and patching of the building structure is required. Make holes in exposed locations, in or through existing floors, by drilling and smooth by sanding. Use of a jackhammer is permitted only where specifically approved. Make holes through masonry walls to accommodate sleeves with an iron pipe masonry core saw.

## 3.5 CLEANING

Thoroughly clean surfaces of piping and equipment that have become covered with dirt, plaster, or other material during handling and construction before such surfaces are prepared for final finish painting or are enclosed within the building structure. Before final acceptance, clean mechanical equipment, including piping, ducting, and fixtures, and free from dirt, grease, and finger marks.

## 3.6 PENETRATIONS

Provide sleeves and prepared openings for duct mains, branches, and other penetrating items, and install during the construction of the surface to be penetrated. Cut sleeves flush with each surface. Place sleeves for round duct 380 mm and smaller. Build framed, prepared openings for round

duct larger than 380 mm and square, rectangular or oval ducts. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Provide 25 mm clearance between penetrating and penetrated surfaces except at grilles, registers, and diffusers. Pack spaces between sleeve or opening and duct or duct insulation with mineral fiber conforming with JIS A 9504, Type 1, Class B-2.

### 3.6.1 Sleeves

Fabricate sleeves, except as otherwise specified or indicated, from 1 mm thick mill galvanized sheet metal. Where sleeves are installed in bearing walls or partitions, provide black steel pipe conforming with JIS G 3452, Schedule 20.

### 3.6.2 Framed Prepared Openings

Fabricate framed prepared openings from 1 mm galvanized steel, unless otherwise indicated.

### 3.6.3 Insulation

Provide duct insulation in accordance with Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS continuous through sleeves and prepared openings except firewall penetrations. Terminate duct insulation at fire dampers and flexible connections. For duct handling air at or below 16 degrees C, provide insulation continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air.

### 3.6.4 Closure Collars

Provide closure collars of a minimum 100 mm wide, unless otherwise indicated, for exposed ducts and items on each side of penetrated surface, except where equipment is installed. Install collar tight against the surface and fit snugly around the duct or insulation. Grind sharp edges smooth to prevent damage to penetrating surface. Fabricate collars for round ducts 380 mm in diameter or less from 1 mm galvanized steel. Fabricate collars for square and rectangular ducts, or round ducts with minimum dimension over 380 mm from 1.40 mm galvanized steel. Fabricate collars for square and rectangular ducts with a maximum side of 380 mm or less from 1 mm galvanized steel. Install collars with fasteners a maximum of 150 mm on center. Attach to collars a minimum of 4 fasteners where the opening is 300 mm in diameter or less, and a minimum of 8 fasteners where the opening is 500 mm in diameter or less.

### 3.6.5 Firestopping

Where ducts pass through fire-rated walls, fire partitions, and fire rated chase walls, seal the penetration with fire stopping materials as specified in Section 07 84 00 FIRESTOPPING.

## 3.7 IDENTIFICATION SYSTEMS

Provide identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and item number on all valves and dampers. Provide tags that are 35 mm minimum diameter with stamped or engraved markings. Make indentations black for reading clarity. Attach tags to valves with No. 12 AWG 2 mm diameter corrosion-resistant steel wire, copper wire, chrome-plated beaded chain or

plastic straps designed for that purpose.

## 3.8 DUCTWORK LEAK TEST

Perform ductwork leak test for the entire air distribution and exhaust system, including fans, coils, filters. Provide test procedure, apparatus, and report that conform to JIS Z 2330. Complete ductwork leak test with satisfactory results prior to applying insulation to ductwork exterior or concealing ductwork.

## 3.9 DAMPER ACCEPTANCE TEST

Submit the proposed schedule, at least 2 weeks prior to the start of test. Operate all fire dampers and smoke dampers under normal operating conditions, prior to the occupancy of a building to determine that they function properly. Test each fire damper equipped with fusible link by having the fusible link cut in place. Test dynamic fire dampers with the air handling and distribution system running. Reset all fire dampers with the fusible links replaced after acceptance testing. To ensure optimum operation and performance, install the damper so it is square and free from racking.

## 3.10 TESTING, ADJUSTING, AND BALANCING

The requirements for testing, adjusting, and balancing are specified in Section 23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC. Begin testing, adjusting, and balancing only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

## 3.11 PERFORMANCE TESTS

After testing, adjusting, and balancing is complete as specified, test each system as a whole to see that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Record the testing during the applicable season.Make corrections and adjustments as necessary to produce the conditions indicated or specified. Conduct capacity tests and general operating tests by an experienced engineer. Provide tests that cover a required period of not less than 6 days for each system and demonstrate that the entire system is functioning according to the specifications. Make coincidental chart recordings at points indicated on the drawings for the duration of the time period and record the temperature at space thermostats or space sensors, the humidity at space humidistats or space sensors and the ambient temperature and humidity in a shaded and weather protected area.
Submit test reports for the ductwork leak test, and performance tests in booklet form, upon completion of testing. Document phases of tests performed including initial test summary, repairs/adjustments made, and final test results in the reports.

## 3.12 CLEANING AND ADJUSTING

Wipe equipment clean, with no traces of oil, dust, dirt, or paint spots. Provide temporary filters prior to startup of all fans that are operated during construction, and provide new filters after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. Perform and document that proper "Indoor Air Quality During Construction" procedures have been

followed; provide documentation showing that after construction ends, and prior to occupancy, new filters were provided and installed. Maintain system in this clean condition until final acceptance. Properly lubricate bearings with oil or grease as recommended by the manufacturer. Tighten belts to proper tension. Adjust control valves and other miscellaneous equipment requiring adjustment to setting indicated or directed. Adjust fans to the speed indicated by the manufacturer to meet specified conditions. Maintain all equipment installed under the contract until close out documentation is received, the project is completed and the building has been documented as beneficially occupied.

## 3.13 OPERATION AND MAINTENANCE

### 3.13.1 Operation and Maintenance Manuals

Submit six manuals at least 2 weeks prior to field training. Submit data complying with the requirements specified in OPERATION AND MAINTENANCE DATA. Submit Data Package 3 for the items/units listed under SD-10 Operation and Maintenance Data

### 3.13.2 Operation And Maintenance Training

Conduct a training course for the members of the operating staff as designated by the Contracting Officer. Make the training period consist of a total of 48 hours of normal working time and start it after all work specified herein is functionally completed and the Performance Tests have been approved. Conduct field instruction that covers all of the items contained in the Operation and Maintenance Manuals as well as demonstrations of routine maintenance operations. Submit the proposed On-site Training schedule concurrently with the Operation and Maintenance Manuals and at least 14 days prior to conducting the training course.

-- End of Section --

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# SECTION 23 81 00

# DECENTRALIZED UNITARY HVAC EQUIPMENT
**05/18**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS B 8607 | (2008) Flare Type and Brazing Type Fittings for Refrigerants |
| JIS B 8615-1 | (2013) Non-ducted Air Conditioners and Heat Pumps-Testing and Rating for Performance |
| JIS B 8616 | (2015) Package Air Conditioners |
| JIS B 9908-1 | (2019) Test Method of Air Filter Units for Ventilation and Electric Air Cleaners for Ventilation-Part 1: Technical Specifications, Requirements and Classification System Based Upon Particulate Matter Efficiency |
| JIS C 4212 | (2010) Low-Voltage Three-Phase Squirrel-Cage High-Efficiency Induction Motors (Amendment 1) |
| JIS C 9730-1 | (2019) Automatic Electrical Controls-Part 1: General Requirements |
| JIS C 9730-2-9 | (2010) Automatic Electrical Controls for Household and Similar Use-Part 2-9: Particular Requirements for Temperature Sensing Controls |
| JIS G 3302 | (2019) Hot Dip Zinc Coated Steel Sheet and Strip |
| JIS H 3300 | (2018) Copper and Copper Alloy Seamless Pipes and Tubes |
| JIS H 3401 | (2001) Pipe Fittings of Copper and Copper Alloys |
| JIS H 8641 | (2007) Hot Dip Galvanized Coatings |
| JIS Z 2371 | (2015) Methods of Salt Spray Testing |

MLIT MECHANICAL STANDARD SPECIFICATION

| | |
|---|---|
| MLIT-M | (2019) Public Building Construction Standard Specification |

JAPAN REFRIGERATION AND AIR CONDITIONING INDUSTRY ASSOCIATION

| | |
|---|---|
| JRA Standard | Japan Refrigeration and Air Conditioning |

THE JAPAN ELECTRICAL MANUFACTURERS' ASSOCIATION (JEMA)

| | |
|---|---|
| JEM 1038 | AC Electromagnetic Contactor |
| JEM 1167 | High Voltage Electromagnetic Contactor |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Field-Assembled Refrigerant Piping

SD-03 Product Data

Air-Cooled Heat Pump, Air to Air

Air Conditioners (DOAS)

SD-06 Test Reports

Start-Up and Initial Operational Tests

SD-10 Operation and Maintenance Data

Air Conditioners, Data Package 3

Air-cooled Heat Pump, Air to Air, Data Package 3

Filters, Data Package 2

Thermostats, Data Package 2

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Operation And Maintenance Manuals; G

Demonstrations; G

## 1.3 QUALITY ASSURANCE

### 1.3.1 Modification of References

Accomplish work in accordance with the referenced publications, except as

modified by this section. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to "the Authority having jurisdiction," "the Administrative Authority," "the Owner," or "the Design Engineer" to mean the Contracting Officer.

### 1.3.2 Detail Drawing

For refrigerant piping, submit piping, including pipe sizes.

### 1.3.3 Safety

Design, manufacture, and installation of unitary air conditioning equipment shall conform to Japanese Refrigeration Safety Regulations (Nihon-Reitou-Hoan-Kisoku).

### 1.3.4 Posted Operating Instructions

Submit posted operating instructions for each packaged air conditioning unit.

### 1.3.5 Sizing

Size equipment based on MLIT-M;do not oversize.

### 1.3.6 Ozone Depleting Substances Technician Certification

All technicians working on equipment that contain ozone depleting refrigerants must be Refrigerant Handling Technician (Reibai-Furontou-Toriatsukai-Gijutsusha) under Japan Refrigeration and Air-Conditioning Industry Association. Provide copies of technician certifications to the Contracting Officer at least 14 calendar days prior to work on any equipment containing these refrigerants.

## 1.4 REFRIGERANTS

Refrigerants must have an Ozone Depletion Potential (ODP) no greater than 0.0, with the exception of R-123. CFC-based refrigerants are prohibited. HCFCs and Halons shall not be permitted. Refrigerant R-32 which are non-ODS refrigerants, shall be applied for this purpose.

## 1.5 ENVIRONMENTAL REQUIREMENTS

For proper Indoor Environmental Quality, maintain positive pressure within the building. Meet or exceed filter media efficiency as tested in accordance with JIS B 9908-1.

# PART 2 PRODUCTS

## 2.1 AIR-COOLED HEAT PUMP, AIR TO AIR

Provide factory assembled units complete with accessories, wiring, piping, and controls. Provide units with outlet grilles.supplemental electric heaters. air filters as specified in the paragraph FILTERS.

### 2.1.1 Energy Performance

Energy performance shall be in accordance with JIS B 8615-1. Heat pumps

shall have a minimum COP of 3.25.

2.1.2 Air Coils

Extended-surface fin and tube type with seamless copper or aluminum tubes with aluminum fins securely bonded to the tubes. On coils with all-aluminum construction, provide tubes of aluminum alloy provide fins of aluminum alloy and provide tube sheets of aluminum alloy. Provide a coating on outdoor air coils as specified in the paragraph COATINGS FOR FINNED TUBE COILS. Coils to be coated shall be part of manufacturer's standard product for capacities and ratings indicated and specified. Provide plate type fins.

2.1.3 Compressors

For equipment over 35 kW, provide automatic capacity reduction of at least 50 percent of rated capacity. Units with cylinder unloading shall start with capacity reduction devices in the unloaded position. Provide compressors with devices to prevent short cycling when shutdown by safety controls. Provide reciprocating compressors with crankcase heaters, and vibration isolators.

2.1.4 Mounting Provisions

Provide units that permit mounting as indicated. Provide suitable lifting attachment plates to enable equipment to be lifted to normal position.

2.1.5 Temperature Controls

Provide controls as specified in JIS B 8615-1 and as modified herein. Provide indoor thermostats of the adjustable type that conform to applicable requirements of JIS C 9730-1 and JIS C 9730-2-9. Provide manual means for temperature set-back. Provide thermostats capable of controlling supplemental heat as specified in JIS B 8615-1.

2.1.6 Accessories

In addition to accessories specified in JIS B 8615-1, provide the following accessories for heat pump units.

a. Protective grille around outside unit coils

b. Start capacitor kit

2.2 AIR CONDITIONERS

2.2.1 Single Package Air-Cooled Heat Pump Type (DoAS)

DOAS Unit is a Factory Assembled unit, complete with accessories, wiring, piping and controls. DOAS Unit is provided with outlet grilles, and air filters as specified in the paragraph FILTERS. DOAS Unit is a packaged unit with heat pump to provide heating and cooling. Base ratings on the use of matched assemblies. Units shall have a minimum compressor cooling COP of 3.5 and heating COP 3.4 when tested in accordance with JIS B 8616 or JIS B 8615-1 as applicable. Provide capacity, electrical characteristics and operating conditions as indicated. Condensers shall provide not less than -12 degrees C liquid subcooling at standard ratings.

2.2.2 Single Zone Units

Provide single zone type units arranged to draw through coil sections. Air may be drawn through heating section.

2.2.3 Compressors

For compressors over 70 kW, compressor speed shall not exceed 3450 rpm. For systems over 35 kW provide automatic capacity reduction of at least 50 percent of rated capacity. Capacity reduction may be accomplished by cylinder unloading, use of multi- or variable speed compressors, use of multiple, but not more than four compressors, or a combination of the two methods. Units with cylinder unloading shall start with capacity reduction devices in the unloaded position. Units with multiple compressors shall have means to sequence starting of compressors. Provide compressors with devices to prevent short cycling when shut down by safety controls. Device shall delay operation of compressor motor for at least 3 minutes but not more than 6 minutes. Provide a pumpdown cycle for units 70 kW and over. Provide reciprocating compressors with crankcase heaters in accordance with the manufacturer's recommendations. If compressors are paralleled, provide not less than two independent circuits.

2.2.4 Coils

On coils with all-aluminum construction, provide tubes of aluminum alloy; provide fins of aluminum alloy and provide tube sheets of aluminum alloy. Provide a separate air cooled condenser circuit for each compressor or parallel compressor installation. Provide a coating on condenser and evaporator coils and fins as specified in the paragraph COATINGS FOR FINNED TUBE COILS. Coils to be coated shall be part of manufacturer's standard product for capacities and ratings indicated and specified. Provide plate type fins.

2.2.5 Condenser Controls

Provide start-up and head pressure controls to allow for system operation at ambient temperatures down to 24 degrees C.

2.2.6 Fans

Provide belt-driven evaporator fans with adjustable pitch pulleys; except for units less than 17 1/2 kW capacity, direct drive with at least two speed taps may be used. Select pulleys at approximately midpoint of the adjustable range.

2.2.7 Thermostats

Provide adjustable type that conforms to applicable requirements of JIS C 9730-1 and JIS C 9730-2-9. Provide combination heating-cooling type with contacts hermetically sealed against moisture, corrosion, lint, dust, and foreign material. Design to operate on not more than 0.83 degrees C differential and of suitable range calibrated in degrees C.

2.2.7.1 Cooling

a. When thermostat is in "COOL" position with fan selector switch in "AUTO" position, compressor, evaporator fan, and condenser fan shall

cycle together.

b. When thermostat is in "COOL" position with fan selector switch in "ON" position, compressor, and condenser fan shall cycle together and evaporator fan shall run continuously.

2.2.7.2 Heating

a. When thermostat is in "HEAT" position with fan selector switch in "AUTO" position, heater and supply air fan shall cycle together. Provide a separate thermostat to keep the fan running until the heater cools.

b. When thermostat is in "HEAT" position with fan selector switch in "ON" position, heater shall cycle and supply air fan shall run continuously.

2.2.7.3 Supply Air Fan

a. When fan selector switch is in "AUTO" position with thermostat in "OFF" position, fan shall not run.

b. When fan selector switch is in "ON" position, fan shall run continuously.

## 2.3 FILTERS

Provide filters to filter outside air, and install inside air conditioners. Provide replaceable (throw-away) type filters. Filters shall conform to JIS B 9908-1.

### 2.3.1 Replaceable Type Filters

Throw-away frames and media, standard dust holding capacity, 1.79 m/s maximum face velocity, and 50 mm thick. Filters shall be in accordance with JIS B 9908-1.

## 2.4 COATINGS FOR FINNED TUBE COILS

Where stipulated in equipment specifications of this section, coat finned tube coils of the affected equipment as specified below. Apply coating at the premises of a company specializing in such work. Degrease and prepare for coating in accordance with the coating applicator's procedures for the type of metals involved. Completed coating shall show no evidence of softening, blistering, cracking, crazing, flaking, loss of adhesion, or "bridging" between the fins.

### 2.4.1 Phenolic Coating

Provide a resin base thermosetting phenolic coating. Apply coating by immersion dipping of the entire coil. Provide a minimum of two coats. Bake or heat dry coils following immersions. After final immersion and prior to final baking, spray entire coil with particular emphasis given to building up coating on sheared edges. Total dry film thickness shall be 0.064 to 0.076 mm.

## 2.5 MOTORS AND STARTERS

JIS C 4212 or JEM 1038, and JEM 1167. Variable speed. Motors less than

3/4 kW shall meet JIS C 4212 requirements. Motors 3/4 kW and larger shall meet JIS C 4212 requirements. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters. Provide motors to operate at full capacity with a voltage variation of plus or minus 10 percent of the motor voltage rating. Motor size shall be sufficient for the duty to be performed and shall not exceed its full load nameplate current rating when driven equipment is operated at specified capacity under the most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide reduced voltage type motor starters. Provide general-purpose weather-resistant type starter enclosures.

## 2.6 REFRIGERANT PIPING AND ACCESSORIES

Provide accessories as specified in JIS B 8615-1 and this section.

### 2.6.1 Factory Charged Tubing

Provide extra soft, deoxidized, bright annealed copper tubing conforming to JIS H 3300, factory dehydrated and furnished with a balanced charge of refrigerant recommended by manufacturer of equipment being connected. The insulation on the factory charged tubing must be in accordance with Section 23 07 00. Provide quick-connectors with caps or plugs to protect couplings. Include couplings for suction and liquid line connections of the indoor and outdoor sections.

### 2.6.2 Field-Assembled Refrigerant Piping

Material and dimensional requirements for field-assembled refrigerant piping, valves, fittings, and accessories shall conform to in accordance with Japanese Refrigeration Safety Regulations (Nihon-Reitou-Hoan-Kisoku) for Japanese product and JIS H 3300 and JIS B 8607, except as herein specified. Factory clean, dehydrate, and seal piping before delivery to the project location. Provide seamless copper tubing, hard drawn, Type K or L, conforming to JIS H 3300, except that tubing with outside diameters of6.35 mm and 9.52 mm shall have nominal wall thickness of not less than 7.62 mm and 0.81 mm, respectively. Soft annealed copper tubing conforming to JIS H 3300 may be used where flare connections to equipment are required only in nominal sizes less than one inch outside diameter.

### 2.6.3 Fittings

JIS H 3401 for solder-joint fittings. Recommended by manufacturer for flared tube fittings.

### 2.6.4 Pipe Hangers and Supports

Pipe hangers and supports shall be in accordance with MLIT-M.

### 2.6.5 Pipe Sleeves

Provide sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 6.35 mm space between exterior of piping or pipe insulation and interior of sleeve. Firmly pack space with insulation and caulk at both ends of

the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.

2.6.5.1 Sleeves in Masonry and Concrete Walls, Floors, and Roofs

Provide Schedule 40 or Standard Weight zinc-coated steel pipe sleeves. Extend sleeves in floor slabs 80 mm above finished floor.

2.6.5.2 Sleeves in Partitions and Non-Masonry Structures

Provide zinc-coated steel sheet sleeves having a nominal weight of not less than 4.39 kg per square meter, in partitions and other than masonry and concrete walls, floors, and roofs.

## 2.7 FINISHES

Provide steel surfaces of equipment including heat pumps that do not have a zinc coating conforming to JIS H 8641, JIS G 3302 or a duplex coating of zinc and paint, with a factory applied coating or paint system. Provide a coating or paint system on actual equipment identical to that on salt-spray test specimens with respect to materials, conditions of application, and dry-film thickness.

## 2.8 SOURCE QUALITY CONTROL

### 2.8.1 Salt-Spray Tests

Salt-spray test shall be factory-applied coating or paint system of equipment including heat pumps in accordance with JIS Z 2371.

## 2.9 MANUFACTURER'S STANDARD NAMEPLATES

Major equipmentincluding fans, and motors must have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment. Plates must be durable and legible throughout equipment life. Plates must be fixed in prominent locations.

# PART 3 EXECUTION

## 3.1 EQUIPMENT INSTALLATION

Install equipment and components in a manner to ensure proper and sequential operation of equipment and equipment controls. Install equipment not covered in this section, or in manufacturer's instructions, as recommended by manufacturer's representative. Provide proper foundations for mounting of equipment, accessories, appurtenances, piping and controls including, but not limited to, supports, vibration isolators, stands, guides, anchors, clamps and brackets. Foundations for equipment shall conform to equipment manufacturer's recommendation, unless otherwise indicated. Set anchor bolts and sleeves using templates. Provide anchor bolts of adequate length, and provide with welded-on plates on the head end embedded in the concrete. Level equipment bases, using jacks or steel wedges, and neatly grout-in with a nonshrinking type of grouting mortar. Locate equipment to allow working space for servicing including shaft removal, disassembling compressor cylinders and pistons, replacing or adjusting drives, motors, or shaft seals, access to water heads and valves of shell and tube equipment, tube cleaning or replacement, access to automatic controls, refrigerant charging, lubrication, oil draining and

working clearance under overhead lines. Provide electric isolation between dissimilar metals for the purpose of minimizing galvanic corrosion.

## 3.2 PIPING

Brazing, bending, forming and assembly of refrigerant piping shall conform to JIS H 3300 and JIS B 8607.

### 3.2.1 Pipe Hangers and Supports

Design and fabrication of pipe hangers, supports, and welding attachments shall conform to MLIT-M. Installation of hanger types and supports for bare and covered pipes shall conform to MLIT-M. Unless otherwise indicated, horizontal and vertical piping attachments shall conform to MLIT-M.

### 3.2.2 Refrigerant Piping

Cut pipe to measurements established at the site and work into place without springing or forcing. Install piping with sufficient flexibility to provide for expansion and contraction due to temperature fluctuation. Where pipe passes through building structure pipe joints shall not be concealed, but shall be located where they may be readily inspected. Install piping to be insulated with sufficient clearance to permit application of insulation. Install piping as indicated and detailed, to avoid interference with other piping, conduit, or equipment. Except where specifically indicated otherwise, run piping plumb and straight and parallel to walls and ceilings. Trapping of lines will not be permitted except where indicated. Provide sleeves of suitable size for lines passing through building structure. Braze refrigerant piping with silver solder. Inside of tubing and fittings shall be free of flux. Clean parts to be jointed with emery cloth and keep hot until solder has penetrated full depth of fitting and extra flux has been expelled. Cool joints in air and remove flame marks and traces of flux. During brazing operation, prevent oxide film from forming on inside of tubing by slowly flowing dry nitrogen through tubing to expel air. Make provisions to automatically return oil on halocarbon systems. Installation of piping shall comply with JIS H 3300 and JIS B 8607.

### 3.2.3 Returning Oil From Refrigerant System

Install refrigerant lines so that gas velocity in the evaporator suction line is sufficient to move oil along with gas to the compressor. Where equipment location requires vertical risers, line shall be sized to maintain sufficient velocity to lift oil at minimum system loading and corresponding reduction of gas volume. Install a double riser when excess velocity and pressure drop would result from full system loading. Larger riser shall have a trap, of minimum volume, obtained by use of 90- and 45-degree ells. Arrange small riser with inlet close to bottom of horizontal line, and connect to top of upper horizontal line. Do not install valves in risers.

## 3.3 DRAIN CONNECTIONS, AND DRAIN LINES

Provide drain lines full size of drain opening. Traps and piping to drainage disposal points shall conform to Section 22 00 00 PLUMBING, GENERAL PURPOSE.

## 3.4 AIR FILTERS

Allow access space for servicing filters. Install filters with suitable sealing to prevent bypassing of air. Perform and document that proper Indoor Air Quality During Construction procedures have been followed; this includes providing documentation showing that after construction ends, and prior to occupancy, new filters were provided and installed.

## 3.5 IDENTIFICATION TAGS AND SEALS

Provide equipment, gages and controllers with tags numbered and stamped for their use. Provide manufacturer's standard seals.

## 3.6 FIELD QUALITY CONTROL

### 3.6.1 Leak Testing

Upon completion of installation of air conditioning equipment, test factory- and field-installed refrigerant piping with an electronic-type leak detector. Use same type of refrigerant to be provided in the system for leak testing. When nitrogen is used to boost system pressure for testing, ensure that it is eliminated from the system before charging. Minimum refrigerant leak field test pressure shall be as specified in accordance with Japanese Refrigeration Safety Regulations (Nihon-Reitou-Hoan-Kisoku) for Japanese standard. If leaks are detected at time of installation or during warranty period, remove the entire refrigerant charge from the system, correct leaks, and retest system.

### 3.6.2 Evacuation, Dehydration, and Charging

After field charged refrigerant system is found to be without leaks or after leaks have been repaired on field-charged and factory-charged systems, evacuate the system using a reliable gage and a vacuum pump capable of pulling a vacuum of at least 133 Pa absolute. Evacuate system in accordance with the triple-evacuation and blotter method or in accordance with equipment manufacturer's printed instructions and recharge system.

### 3.6.3 Start-Up and Initial Operational Tests

Test the air conditioning systems and systems components for proper operation. Adjust safety and automatic control instruments as necessary to ensure proper operation and sequence. Conduct operational tests for not less than 8 hours.

### 3.6.4 Performance Tests

Upon completion of evacuation, charging, startup, final leak testing, and proper adjustment of controls, test the systems to demonstrate compliance with performance and capacity requirements. Test systems for not less than 8 hours, record readings hourly. At the end of the test period, average the readings, and the average shall be considered to be the system performance.

## 3.7 TRAINING COURSE

a. Submit a schedule, at least 2 weeks prior to the date of the proposed training course, which identifies the date, time, and location for the training. Conduct a training course for members of the operating

staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests.

b. The field posted instructions shall cover all of the items contained in the approved operation and maintenance manuals as well as demonstrations of routine maintenance operations.

c. Submit 6 complete copies of an operation manual in bound 216 by 279 booklets listing step-by-step procedures required for system startup, operation, abnormal shutdown, emergency shutdown, and normal shutdown at least 4 weeks prior to the first training course. The booklets shall include the manufacturer's name, model number, and parts list. The manuals shall include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features.

d. Submit 6 complete copies of maintenance manual in bound 216 by 279 booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals shall include piping layouts and simplified wiring and control diagrams of the system as installed.

-- End of Section --

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SECTION 25 05 11

CYBERSECURITY FOR FACILITY-RELATED CONTROL SYSTEMS

**05/21**

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# SECTION 25 05 11

# CYBERSECURITY FOR FACILITY-RELATED CONTROL SYSTEMS
**05/21**

## PART 1 GENERAL

Many subparts in this Section contain text in curly braces ("{" and "}") indicating which cybersecurity control and control correlation identifier (CCI) the requirements of the subpart relate to. The text inside these curly braces is for Government reference only and enables coordination of the requirements of this Section with the RMF process throughout the design and construction process. Text in curly braces are not contractor requirements.

Cybersecurity requirements for this project are limited in scope and are to be coordinated with the Contracting Officer's Representative prior to execution to ensure they follow the current best-practice, as it pertains to existing base-wide control systems.

### 1.1 RELATED REQUIREMENTS

This section does not contain sufficient requirements to procure a control system and must be used in conjunction with other Sections which specify control systems. This Section adds cybersecurity requirements to the control systems specified in other Sections, and as these requirements are conditioned on the control system being provided, there may be requirements in this Section that will not apply to this project. All Sections containing facility-related control systems or control system components are related to the requirements of this Section. Review all specification sections to determine related requirements.

In cases where a requirement is specified in both this Section and in another Section, the more stringent requirement must be met. In cases where a requirement in this Section conflicts with the requirements of another Section such that both requirements cannot be met at the same time, request direction from the Contracting Officer Representative to determine which requirement applies to the project.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| DODI 8551.01 | (2014) Ports, Protocols, and Services Management (PPSM) |

### 1.3 DEFINITIONS

#### 1.3.1 Administrator Account

An administrator account is an account with full permissions to a device,

application, or operating system, including the ability to create and modify other user accounts.

### 1.3.2 Controller

A device other than a computer or Ethernet switch.

### 1.3.3 Network

A network is a group of two or more devices that can communicate using a network protocol. Network protocols must provide a method for addressing devices on the network; a communication method that does not provide an addressing scheme is not a networked form of communication. Devices that communicate using a method of communication that does not support device addressing are not using a network.

### 1.3.4 Network Connected

A component is network connected (or "connected to a network") only when the device has a network transceiver which is directly connected to the network and implements the network protocol. A device lacking a network transceiver (and accompanying protocol implementation) can never be considered network connected. Note that (unlike many IT definitions of "Network Connected") a device connected to a non-IP network is still considered network connected (an IP connection or IP address is not required for a device to be network connected).

### 1.3.5 Network Media

The thing that provides the communication channel between the devices on a network. Typically wire, but might include wireless, fiber optic, or even power line.

### 1.3.6 User Account Support Levels

The support for user accounts is categorized in this Section as one of three levels:

#### 1.3.6.1 FULLY Supported

Device supports configurable individual accounts. Accounts can be created, deleted, modified, etc. Privileges can be assigned to accounts. These devices support user-based (as opposed to role-based) authentication.

#### 1.3.6.2 MINIMALLY Supported

Device supports a small, fixed number of accounts (perhaps only one). Accounts cannot be modified. A device with only a "User" and an "Administrator" account would fit this category. Similarly, a device with two PINs for logon - one for restricted and one for unrestricted rights would fit here (in other words, the accounts do not have to be the traditional "username and password" structure). These devices typically only support role-based authentication.

Examples of devices which MINIMALLY support accounts are a) a variable frequency drive with a single account which requires a PIN for access to configuration; and b) a room lighting control touchpad interface that has a single account.

#### 1.3.6.3 NOT Supported

Device does not support any Access Enforcement therefore the whole concept of "account" is meaningless.

### 1.3.7 Manual Local Input

Manual Local Inputs are system analog or binary inputs that are adjustable by a person but are, by intrinsic hardware design, very limited in potential capabilities. Manual Local Inputs do not have touch screens or full keyboards, but may have a few buttons or dials to allow input. Manual Local Inputs do not have full graphic screens or dot-matrix displays, but may have simple lights (LEDs) or 7-segment displays. Manual Local Inputs do not have any sort of menu structure, each button has a single well-defined function.

Examples of Manual Local Inputs are H-O-A switches, simple thermostats, and disconnect switches.

### 1.3.8 User Interface

A User Interface (UI) is something other than a Manual Local Input that allows a person to interact with the system or device.
Two important distinctions are 1) whether the user interface is Local or Remote, and 2) the effective capabilities of the User Interface to alter data, which is the "privilege" of the user interface (where effective privilege available to a specific user at a specific user interface is the combination of the greatest privilege offered by the user interface and the specific account the user is logged into).

#### 1.3.8.1 Local User Interface

A Local User Interface is a user interface where the physical hardware the user interacts with (keyboard, buttons, display, etc.) is physically part of the device being affected. All of the relevant characteristics of the user interface are embodied within a single device.

Note that a Local UI may be able to access data in a different device, Local versus Remote in this context refers to the user interface itself; the capability to access data in a different device is covered under "Full User Interface".

#### 1.3.8.2 Remote User Interface

A Remote User Interface implements a Client/Server model where the physical hardware the user interacts with (Client) is physically distinct from the device being affected (Server). Most or all of the security and functionality characteristics of the user interface are defined by the Server, not the Client. The Client and Server communicate via a network connection. A common example of a remote user interface is a web-based interface where the browser (client) is generally on different hardware than the web server (server). A Remote UI remains a Remote UI even if the user happens to be at a Client on the same hardware as the Server. What is important is that a) the Client may be on different hardware than the Server and b) the majority of the security and functional characteristics of the interface are defined at the Server.

Note that this definition of "remote" is consistent with that generally used in the control industry but is not aligned with the NIST 800-53 definition of "Remote", which refers to "outside the system". The term

"Remote" here better aligns with the NIST 800-53 definition of "Network" (remote from within the system) Access.

1.3.8.3 Types of User Interface (by capability)

User interfaces are also categorized by their capabilities as being Read Only, Limited, or Full.

1.3.8.3.1 Read-Only and View-Only User Interface

A Read Only User Interface (also referred to as a View-Only User Interface) is a user interface that only allows for reading data, it does not allow (have the capability to) modify data. A Read Only User Interface may be either Local or Remote. A User Interface that is configured to be Read Only (by some other means than the interface itself, such as using configuration software on a laptop) is a Read-Only Interface. Note a Read Only User Interface may have buttons (or touch screen, etc.) allowing the user to navigate through the presentation of data.

1.3.8.3.2 Limited User Interface

A Limited User Interface is a user interface that - by design - can only alter information local to the user interface. Note that the determination of "alter" includes only direct interactions, it explicitly excludes interactions that might occur as secondary effects. For example, an interface changing the flow setpoint in a pump controller is a direct interaction, the subsequent change in flow (as well as any subsequent downstream changes in valve position) are not direct interactions.

1.3.8.3.3 Full User Interface

A Full User Interface can alter information in devices outside the device with the user interface.

1.3.8.4 Other User Interface Terminology

In addition to defining whether a user interface is a Hardware Limited, Read-Only, Limited or Full, and whether it is Local or Remote, user interfaces are classified by whether they are writable or privileged.

1.3.8.4.1 Writable User Interface

Any User Interface that is not Read-Only is Writable. (Limited User Interfaces and Full User Interfaces are both writable user interfaces (as they are capable of changing a value)).

1.3.8.4.2 Privileged User Interface

A Privileged UI is a UI that has sufficient capabilities or functionality that it requires specific cybersecurity measures to be put in place to limit its unauthorized use. Ultimately, whether a specific user interface is considered a Privileged User Interface must be determined by usage. Unless otherwise specified, user interfaces can be determined to be privileged or not using the following:

a. Read-Only User Interfaces are not privileged user interfaces.

b. Full User Interfaces are privileged user interfaces.

c. User interfaces that allow for configuration of auditing or allows for modification or deletion of audit logs are privileged user interface.

d. User interfaces that allow for reprogramming a network connected device is a privileged user interface.

e. Except as specified above, a Limited User Interface must be determined to be privileged or not based on the specific capabilities and use case of the user interface. In general however, user interfaces that do not offer significant capabilities above and beyond those available at that location via other means (e.g. such as a disconnect switch, breaker, or hand-off-auto switch, or physical attack) are not privileged.

## 1.4 ADMINISTRATIVE REQUIREMENTS

### 1.4.1 Points of Contact

Coordinate with the following Points of Contact as indicated in this Section and as required. Not all projects will require coordination with all Points of Contact. When coordination is required and no Point of Contact is indicated, coordinate with The Contracting Office Representative (COR).

a. Government Base-Wide DDC Control System and Network Access Point of Contact: The Contracting Office Representative (COR)

b. Password Point of Contact: the Contracting Office Representative (COR)

### 1.4.2 Coordination

Coordinate the execution of this Section with the execution of all other Sections related to control systems as indicated in the paragraph RELATED REQUIREMENTS. Items that must be considered when coordinating project efforts include but are not limited to:

a. The Cybersecurity Interconnection Schedule must be coordinated with other work that will be interconnected to, and interconnections must be approved by the Government before relying on them for system functionality.
b. Cybersecurity testing support must be coordinated across control systems and with the Government cybersecurity testing schedule.

c. Passwords must be coordinated with the indicated contact for the project site.

d. Contractor Computer Cybersecurity Compliance Statements must be provided for each contractor using contractor owned computers.

## 1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Computer Cybersecurity Compliance Statements; G
Contractor Temporary Network Cybersecurity Compliance Statements; G
SD-02 Shop Drawings
Network Communication Report; G
Cybersecurity Riser Diagram; G
SD-03 Product Data
Control System Cybersecurity Documentation; G
SD-11 Closeout Submittals
Confidential Password Report; G
Enclosure Keys; G
Software and Configuration Backups; G
Control System Inventory Report; G

## 1.6 QUALITY CONTROL

### 1.6.1 Pre-Construction Testing

For all control systems provided under this project, coordinate with the control system owner and Contracting Officer's Representative to support Cybersecurity testing, if required.

## 1.7 CYBERSECURITY DOCUMENTATION

{For Government Reference Only: This subpart (and its subparts) relates to PL-7; CCI-003071}

### 1.7.1 Network Communication Report

{For Government Reference Only: This subpart (and its subparts) relates to CA-9, PL-8; CCI-003075; CCI-002102, CCI-002103, CCI-002104, CCI-002105, CCI-003072, CCI-003073, CCI-003075 and also the submittal requirements associated with CM-6, CM-7, SC-8 and SC-41 including CM-7(3), CCI-000388.}

Provide a network communication report. For each networked device, document the communication characteristics of the device including communication protocols, services used, encryption employed, and a general description of what information is communicated over the network. For each device using IP, document all TCP and UDP ports used. For non-IP communications, document communication protocol and media used. If other control system Sections used on this project include submittals documenting this information, provide copies of those submittals to meet this requirement.

In addition to the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, provide the Network Communication Report as an editable Microsoft Excel file.

### 1.7.2 Control System Inventory Report

{For Government Reference Only: This subpart (and its subparts) relates to CM-8(a), SI-17, IA-3; CCI-000389, CCI-000392, CCI-000398, CCI-002773, CCI-002774, CCI-002775, CCI-000777, CCI-000778, CCI-001958}

Provide a Control System Inventory report using the Inventory Spreadsheet listed under this Section at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-25-05-1 documenting all devices, including networked devices, network infrastructure devices, non-networked devices, input devices (e.g. sensors) and output devices (e.g. actuators). For each device provide all

applicable information for which there is a field on the spreadsheet in accordance with the instructions on the spreadsheet.

In addition to the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, provide the Control System Inventory Report as an editable Microsoft Excel file.

### 1.7.3 Software and Configuration Backups

{For Government Reference Only: This subpart (and its subparts) relates to CP-10; CCI-000550, CCI-000551, CCI-000552}

For each computer on which software is installed under this project, provide a recovery image of the final as-built computer. This image must allow for bare-metal restore such that restoration of the image is sufficient to restore system operation to the imaged state without the need for re-installation of software. If additional user permissions are required to meet this requirement, coordinate the creation of the image with the identified Government Computer Access Point of Contact.

For all ethernet switches provide a backup of the switch configuration. For all controllers, provide a backup of the controller configuration and the source code for all loaded application programs (all software that is not common to every controller of the same manufacturer and model).

If any or all of these are provided under another Section, provide documentation indicating this and referencing those submittals.

### 1.7.4 Cybersecurity Riser Diagram

{For Government Reference Only: This subpart (and its subparts) relates to PL-2(a), PL-8; CCI-003051, CCI-003053, CCI-003072, CCI-003073, CCI-003075}

Provide a cybersecurity riser diagram of the complete control system including all network and device hardware. If the control system specifications require a riser diagram submittal, provide a copy of that submittal as the cybersecurity riser diagram. Otherwise, provide a riser diagram in one-line format

### 1.7.5 Control System Cybersecurity Documentation

{For Government Reference Only: This subpart (and its subparts) relates to SA-5 (a),(b),(c); CCIs: CCI-003124, CCI-003125, CCI-003126, CCI-003127, CCI-003128, CCI-003129, CCI-003130, CCI-003131}

Provide a Control System Cybersecurity Documentation submittal containing the indicated information for each device and software application.

#### 1.7.5.1 For Control System Devices

##### 1.7.5.1.1 Control System Devices FULLY Supporting User Accounts

For all HVAC Control System Devices which FULLY support user accounts, provide:

a. Documentation that describes secure configuration of the device {For Government Reference Only: relates to CCI-003124}

b. Documentation that describes secure operation of the device {For Government Reference Only: relates to CCI-003124}

c. Documentation that describes effective use and maintenance of security functions or mechanisms for the device {For Government Reference Only: relates to CCI-003127}

d. Documentation that describes known vulnerabilities regarding configuration and use of administrative (i.e. privileged) functions for the device {For Government Reference Only: relates to CCI-003128}

e. Documentation that describes user-accessible security functions or mechanisms in the device and how to effectively use those security functions or mechanisms; or a specific indication that there are no user-accessible security functions or mechanisms in the device {For Government Reference Only: relates to CCI-003129}

f. Documentation that describes methods for user interaction which enables individuals to use the device in a more secure manner {For Government Reference Only: relates to CCI-003130}

#### 1.7.5.1.2 All Control System Devices

For all Control System Devices which do not FULLY support user accounts, provide:

a. Documentation that describes secure configuration of the device; or a specific indication that there are no secure configuration steps that apply {For Government Reference Only: relates to CCI-003124}

b. Documentation that describes effective use and maintenance of security functions or mechanisms for the device; or a specific indication that there are no security functions or mechanisms in the device {For Government Reference Only: relates to CCI-003127}

c. For devices which include a user interface, documentation that describes methods for user interaction which enables individuals to use the device in a more secure manner {For Government Reference Only: relates to CCI-003130}

## 1.8 CYBERSECURITY DURING CONSTRUCTION

{For Government Reference Only: This subpart (and its subparts) relates to AC-18, SA-3; CCI-000258}

In addition to the control system cybersecurity requirements indicated in this section, meet following requirement throughout the construction process.

### 1.8.1 Contractor Computer Equipment

Contractor owned computers may be used for construction. Contractor computers connected to the control system, control system network, or a control system component at any point during construction must meet the following requirements:

1.8.1.1 Operating System

The operating system must be an operating system currently supported by the manufacturer of the operating system. The operating system must be current on security patches and operating system manufacturer required updates.

1.8.1.2 Anti-Malware Software

The computer must run anti-malware software from a reputable software manufacturer. Anti-malware software must be a version currently supported by the software manufacturer, must be current on all patches and updates, and must use the latest definitions file. Computers used on this project must be scanned using the installed software at least once per day.

1.8.1.3 Passwords and Passphrases

The passwords and passphrases for computers, applications, and web-based applications supporting passwords must be changed from their default values. Passwords must be a minimum of eight characters with a minimum of one uppercase letter, one lowercase letter, one number and one special character.

1.8.1.4 User-Based Authentication

Each user must have a unique account; sharing of a single account between multiple users is prohibited.

1.8.1.5 Demonstration of Compliance

The Government has the right to require demonstration of computer compliance with these requirements at any time during the project.

1.8.1.6 Contractor Computer Cybersecurity Compliance Statements

Provide a single submittal containing completed Contractor Computer Cybersecurity Compliance Statements for each company using contractor owned computers. Contractor Computer Cybersecurity Compliance Statements must use the template published at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-25-05-1 Each Statement must be signed by a cybersecurity representative for the relevant company.

1.8.2 Temporary IP Networks

Temporary contractor-installed IP networks may be used during construction. When used, temporary contractor-installed IP networks connected to the control system, control system network, or a control system component at any point during construction must meet the following requirements:

1.8.2.1 Network Boundaries and Connections

The network must not extend outside the project site and must not connect to any IP network other than those specifically provided or furnished for this project. Any and all access to the network from outside the project site is prohibited.

### 1.8.3 Government Access to Network

Government personnel must be allowed to have complete and immediate access to the network at any time in order to verify compliance with this specification.

### 1.8.4 Passwords and Passphrases

The passwords and passphrases for all network devices and network access must be changed from their default values. Passwords must be a minimum 8 characters with a minimum of one uppercase letter, one lowercase letter, one number and one special character.

### 1.8.5 Contractor Temporary Network Cybersecurity Compliance Statements

Provide a single submittal containing completed Contractor Temporary Network Cybersecurity Compliance Statements for each company implementing a temporary IP network. Contractor Temporary Network Cybersecurity Compliance Statements must use the template published at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-25-05-1 Each Statement must be signed by a cybersecurity representative for the relevant company. If no temporary IP networks will be used, provide a single copy of the Statement indicating this.

## 1.9 CYBERSECURITY DURING WARRANTY PERIOD

All work performed on the control system after acceptance must be performed using Government Furnished Equipment or equipment specifically and individually approved by the Government.

# PART 2 PRODUCTS

All products used on this project must meet the indicated requirements, but not all products specified here will be required by every project.

# PART 3 EXECUTION

## 3.1 CYBERSECURITY HARDENING AND CONFIGURATION GUIDES

Install, configure, and harden all hardware and software furnished on this project in accordance with manufacturer provided documentation, procedures, or methods for secure configuration or installation. Do not implement specific hardening actions if that action would conflict with required functionality or another requirement of this Section.

## 3.2 NETWORK REQUIREMENTS

### 3.2.1 Non-IP Control Networks

When control system specifications require particular communication protocols, use only those communication protocols and only as specified. Do not implement any other communication protocol.

When control system specifications do not indicate requirements for communication protocols, use only those protocols required for operation of the system as specified.

3.2.2 IP Control Networks

{For Government Reference Only: This subpart relates to CM-6(a), CM-7(a), CM-7(b), CM-7(1)(b), SC-41; CCI-001588, CCI-000381, CCI-000380, CCI-000381, CCI-000382, CCI-001761, CCI-001762, CCI-002544, CCI-002545, CCI-002546.}

IP Networks must be Ethernet networks and must use switches which are Ethernet Switches as defined in this Section. Do not use nonsecure functions, ports, protocols and services as defined in DODI 8551.01 unless those ports, protocols and services are specifically required by the control system specifications or otherwise specifically authorized by the Government. Do not use ports, protocols and services that are not specified in the control system specifications or required for operation of the control system.

Do not utilize wireless Networks or wireless infrastructure for this project.

3.2.2.1 IP Network Routers

Do not install any device that performs IP routing.

3.2.3 Device Identification and Authentication{For Government Reference Only: This subpart (and its subparts) relates to IA-3; CCI-000777, CCI-000778, CCI-001958.}3.3 ACCESS CONTROL REQUIREMENTS

3.3.1 User Accounts

{For Government Reference Only: This subpart (and its subparts) relate to AC-2(a), AC-3, AC-6(1), AC-6(10), AC-6(2), AC-6(9), CM-11(2), and IA-2; CCI-002110, CCI-000213, CCI-002235, CCI-001558, CCI-002221, CCI-002222, CCI-002223, CCI-002235, CCI-000039, CCI-001419, CCI-002234, CCI-001812, and CCI-000764.}

Any user interface supporting user accounts (either FULLY or MINIMALLY) must limit access according to specified limitations for each account. Install and configure any device having a STIG or SRG in accordance with that STIG or SRG.

All user interfaces FULLY supporting accounts must implement user-based authentication where each account is uniquely assigned to a specific user. User interfaces FULLY supporting accounts must implement at least three (3) levels of user account privilege including: 1) an account with read-only permissions 2) an account with full permissions including account creation and modification and 3) an account with greater permissions than read-only but without account creation and modification.

3.3.1.1 Controllers

For user interfaces provided by controllers, provide access control in accordance with the User Interface Requirements table for the applicable control system and user interface type.

a. For table entries of "NA": NA means Not Applicable, there are no interfaces in this category.

b. For table entries of "None Required": The user interface is not required to support user accounts.

c. For table entries of "MINIMALLY": The user interface must at least MINIMALLY support user accounts.

d. For table entries of "FULLY": The user interface must at FULLY support user accounts.

e. For table entries of "Physical Security": The user interface must have physical security in the form of either a key lock on the interface itself or be furnished inside a locked enclosure. Where this is required for a read only interface, this lock must prevent viewing of data on the interface; for other interfaces, this lock must prevent using the interface to alter data.

f. For table entries of "Physical Security": For Local FULL interfaces, the interface must be protected by physical security at least as good as the control devices (and equipment controlled by the control devices) affected by the interface. For purposes of this requirement, 'affected' includes controllers with data that can be directly altered by the interface, as well as mechanical and/or electrical equipment directly controlled by those controllers, but does not include other interactions.

### 3.3.2 System Use Notification

{For Government Reference Only: This subpart (and its subparts) relates to AC-8; CCI-000048, CCI-002247, CCI-002243, CCI-002244, CCI-002245, CCI-002246, CCI-000050, CCI-002248}

#### 3.3.2.1 System Use Notification for Remote User Interfaces

Remote user interfaces must display a warning banner.

#### 3.3.2.2 System Use Notification for Local User Interfaces

Devices which are connected to a network and have a local user interface must display a warning banner on the user interface screen if capable of doing so and must have a permanently affixed label with a warning banner if unable to display the warning banner on the screen. Where it is impractical (perhaps due to device size) to affix the label to the device, affix the label to the device enclosure.

Labels must be machine printed or engraved, plastic or metal, designed for permanent installation, must use a font no smaller than 14 point, and must provide a high contrast between font and background colors.

#### 3.3.2.3 Warning Banner Contents

The Warning Banner shall display one of the following:

Option A: "You are accessing a U.S. Government (USG) Information System (IS) that is provided for USG-authorized use only. By using this IS (which includes any device attached to this IS), you consent to the following conditions:

-The USG routinely intercepts and monitors communications on this IS for purposes including, but not limited to, penetration testing, COMSEC monitoring, network operations and defense, personnel misconduct (PM), law enforcement (LE), and

counterintelligence (CI) investigations.
-At any time, the USG may inspect and seize data stored on this IS.
-Communications using, or data stored on, this IS are not private, are subject to routine monitoring, interception, and search, and may be disclosed or used for any USG-authorized purpose.
-This IS includes security measures (e.g., authentication and access controls) to protect USG interests--not for your personal benefit or privacy.

-Notwithstanding the above, using this IS does not constitute consent to PM, LE or CI investigative searching or monitoring of the content of privileged communications, or work product, related to personal representation or services by attorneys, psychotherapists, or clergy, and their assistants. Such communications and work product are private and confidential. See User Agreement for details."

Option B: If the system is incapable of displaying the required banner verbiage due to its size, a smaller banner must be used. The mandatory verbiage follows “I've read & consent to terms in IS user agreem't.”

### 3.3.3 Permitted Actions Without Identification or Authentication

{For Government Reference Only: This subpart (and its subparts) relates to AC-14; CCI-000061, CCI-000232}

The control system must require identification and authentication before allowing any actions except read-only actions by a user acting from a user interface which MINIMALLY or FULLY supports accounts.

### 3.3.4 Enclosures

Prior to final acceptance of the system, lock all lockable enclosures. Submit an Enclosure Keys submittal with all copies of keys for all enclosures and a key inventory list documenting all keys. Label each key with the matching enclosure identifier.

## 3.4 USER IDENTIFICATION AND AUTHENTICATION

{For Government Reference Only: This subpart (and its subparts) relates to IA-2, IA-2(1),IA-2(12), IA-5 IA-5(b), IA-5(c), IA-5(e), IA-5(g), IA-5(1), IA-5(11); CCI-000764, CCI-000765, CCI-001953, CCI-001954, CCI-001544, CCI-001989, CCI-000182, CCI-001610, CCI-000192, CCI-000193, CCI-000194, CCI-000205, CCI-001619, CCI-001611, CCI-001612, CCI-001613, CCI-001614, CCI-000195, CCI-001615, CCI-000196, CCI-000197, CCI-000199, CCI-000198, CCI-001616, CCI-001617, CCI-000200, CCI-001618, CCI-002041, CCI-002002, CCI-002003. }

This subpart indicates requirements for specific methods of identification and authentication for users and user accounts. Where these requirements conflict apply the following order of precedence: 1) If present, Device Specific Requirements take precedence over any other requirements; and then 2) multifactor authentication requirements take precedence over password requirements.

### 3.4.1 User Identification and Authentication for All System Types

Unless otherwise indicated, all user interfaces supporting accounts (either FULLY or MINIMALLY) must implement Identification and Authorization via passwords.

### 3.4.2 Implementation of Identification and Authorization Requirements

Identification and Authorization must be met by one of the following methods:

a. Direct implementation in the user interface.

b. For remote interfaces: an implementation shared between the remote user interface server and the remote user interface client. For example, a requirement for PIV authentication may be met on a remote user interface by a PIV reader on a web browser client which sends the authentication information via HTTPS to the remote server.

### 3.4.3 Password-Based Authentication Requirements

#### 3.4.3.1 Passwords for Controllers FULLY Supporting Accounts

All controllers FULLY supporting accounts and supporting password-based authentication must enforce the following requirements:

a. Minimum password length of twelve (12) characters

b. Password must contain at least one uppercase character.

c. Password must contain at least one lowercase character.

d. Password must contain at least one numeric character.

e. Password must contain at least one special character. The list of supported special characters must include at least 4 separate characters.

f. Password must have a maximum lifetime of sixty (60) days. When passwords expire, prompt users to change passwords. Do not lock accounts due to expired passwords.

g. Password must differ from previous five (5) passwords, where differ is defined as changing at least fifty percent of the characters.

h. Passwords must be cryptographically protected during storage and transmission.

#### 3.4.3.2 Passwords for Remote Interfaces

Passwords for connecting to a Remote User Interface supporting password-based authentication must enforce the following requirements:

a. Minimum password length of twelve (12) characters

b. Password must contain at least one uppercase character.

c. Password must contain at least one lowercase character.

d. Password must contain at least one numeric character.

e. Password must contain at least one special character. The list of supported special characters must include at least 4 separate characters.

f. Password must have a maximum lifetime of 60 days. When passwords expire, prompt users to change passwords. Do not lock accounts due to expired passwords.

g. Password must differ from previous five passwords, where differ is defined as changing at least 50 percent of the characters (where location is significant, a character may be reused if it is in a different position).

h. Passwords must be cryptographically protected during storage and transmission.

#### 3.4.3.3 Passwords for Devices Minimally Supporting Accounts

Devices MINIMALLY supporting accounts must support passwords with a minimum length of four characters.

#### 3.4.3.4 Password Configuration and Reporting

For all devices with a password, change the password from the default password. Coordinate selection of passwords with the Password Point of Contact. Do not use the same password for more than one device unless specifically instructed to do so. Provide a Confidential Password Report documenting the password for each device and describing the procedure to change the password for each device.

Do not provide the Password Summary Report in electronic format. Provide two hardcopies of the Password Summary Report, each copy in its own sealed envelope.

## 3.5 REQUIREMENTS FOR LEAST FUNCTIONALITY

{For Government Reference Only: This subpart (and its subparts), along with the network communication report submittal specified elsewhere in this section, relates to CM-6(a), CM-6(c), CM-7, CM-7(1)(b), SC-41; CCI-000363, CCI-000364, CCI-000365, CCI-001588, CCI-001755, CCI-000381, CCI-000380, CCI-00382, CCI-001761, CCI-001762, CCI-002544, CCI-002545, CCI-002546.}

For devices that have a STIG or SRG related to Requirements for Least Functionality (such as configuration settings and port and device I/O access for least functionality), install and configure the device in accordance with that STIG or SRGs.

### 3.5.1 Device Capabilities

Do not provide devices with remote user interfaces or with full user interfaces where one is not required. Do not use a networked sensor or actuator where a non-networked sensor or actuator would suffice.

## 3.6 VULNERABILITY SCANNING

{For Government Reference Only: This subpart (and its subparts) relates to RA-5 RA-5(a),RA-5(b),RA-5(c),RA-5(d); CCI-001054, CCI-001055, CCI-000156, CCI-001641, CCI-001643, CCI-001057, CCI-001058, CCI-001059. }

All IP devices must be scannable, such that the device can be scanned by industry standard IP network scanning utilities without harm to the device, application, or functionality.

### 3.6.1 Controllers

Controllers shall be scannable by standard control system discovery tools or control system browsers and return meaningful status information including the network inputs and outputs for the controller. This information shall contain sufficient detail to detect vulnerabilities or exploits of the controller.

## 3.7 FIELD QUALITY CONTROL, CYBERSECURITY VALIDATION SUPPORT

In addition to testing and testing support required by other Sections, provide a minimum of 8 hours of technical support for cybersecurity testing of control systems to support the DoD Risk Management Framework process Cybersecurity assessment of the control system.

-- End of Section --

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DIVISION 26 - ELECTRICAL

SECTION 26 05 48.00 10

SEISMIC AND ANTITERRORISM BRACING FOR ELECTRICAL EQUIPMENT

**10/07**

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SECTION 26 05 48.00 10

SEISMIC AND ANTITERRORISM BRACING FOR ELECTRICAL EQUIPMENT
**10/07**

# PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

THE BUILDING CENTER OF JAPAN (BCJ)

| | |
|---|---|
| BSLJ | Building Standard Law of Japan, current edition |

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM E580/E580M | (2020) Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions |

JAPANESE ARCHITECTURAL STANDARD SPECIFICATIONS (JASS)

| | |
|---|---|
| JASS 6 | (2007) Structural Steelwork Specification for Building Construction |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS C 8105-2 Series | Luminaires: Particular Requirements for Safety |
| JIS G 3101 | (2020) Rolled Steels for General Structure |
| JIS G 3106 | (2020) Rolled Steels for Welded Structure |
| JIS G 3114 | (2022) Hot-Rolled Atmospheric Corrosion Resisting Steels for Welded Structure |
| JIS G 3136 | (2022) Rolled Steels for Building Structure |
| JIS G 3444 | (2021) Carbon Steel Tubes for General Structure |
| JIS G 3475 | (2021) Carbon Steel Tubes for Building Structure |
| JIS G 3466 | (2021) Carbon Steel Square and Rectangular Tubes for General Structure |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 1598 | (2021; Reprint Jun 2021) Luminaires |

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 General Requirements

The requirements for seismic protection measures described in this section shall be applied to the electrical equipment and systems listed below.

### 1.2.2 Antiterrorism (AT) Requirements (UFC 4-010-01)

In a separate load scenario from seismic load cases, all discrete overhead equipment having its weight (W) more than 14 kg shall have its mounting designed to resist the force of 0.5×W along horizontal direction and 1.5×W in the downward direction. Overhead items weighing less than 14 kg, floor-mounted items, and wall-mounted items not overhead do not require AT bracing. Distributed systems such as suspended ceilings, piping and ducts do not require AT bracing, while seismic bracing is still applicable.

### 1.2.3 Electrical Equipment

Electrical equipment shall include the following items to the extent required on the drawings or in other sections of these specifications:

| | |
|---|---|
| Lighting Fixtures | Transformer Station (Outdoor Type) |
| Switchboards (Wall Mounted) | |

### 1.2.4 Contractor Designed Bracing

The bracing for the electrical equipment designated in paragraph 1.2.2 and systems designated in paragraph 1.2.3 must be developed by the Contractor. Submit copies of the Design Calculations with the drawings. Calculations must be prepared, stamped and signed by a 1st class Kenchiku-shi or 2nd class Kenchiku-shi. Calculations must verify the capability of structural members to which bracing is attached for carrying the load from the brace. Resistance to lateral forces induced by earthquakes must be accomplished without consideration of friction resulting from gravity loads. Seismic loading shall determined in accordance with BSLJ and JASS 6 must be used for the design. Provide sufficient braces for equipment to resist a horizontal force as specified in the above paragraphs without exceeding safe working stress of bracing components. Provide, for approval, specific force calculations for the equipment bracing in the project.

### 1.2.5 Conduits Requiring No Special Seismic Restraints

Seismic restraints may be omitted from electrical conduit less than 60 mm trade size. All other interior conduit, shall be seismically protected as specified.

## 1.3 EQUIPMENT REQUIREMENTS

Submit detail drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail, indicating thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

### 1.3.1 Rigidly Mounted Equipment

Equipment furnished under this contract must be rigidly mounted using cast-in-place anchor bolts to anchor them or post-installed anchors that are qualified for earthquake loading. Suspended equipment bracing attachments should be located just above the center of gravity to minimize swinging. Components needed for continued operation after an earthquake must have two nuts provided on each anchor bolt.

### 1.3.2 Nonrigid or Flexibly-Mounted Equipment

Select vibration isolation devices so that the maximum movement of equipment from the static deflection point is 6 mm . Equipment flexibly mounted on vibration isolators must have a bumper restraint or snubber in each horizontal direction and vertical restraints must be provided where require to resist overturning. Isolator housing and restraints must be constructed of ductile materials. A visco-elastic pad or similar material of appropriate thickness must be used between the bumper and components to limit the impact load. Restraints must be designed to resist the calculated horizontal lateral and vertical forces.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G". Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Lighting Fixtures in Buildings
Equipment Requirements

SD-03 Product Data

Lighting Fixtures in Buildings; G
Equipment Requirements; G
Contractor Designed Bracing; G
Anchor Bolts; G
Vibration Isolators; G

SD-05 Design Data

Design Calculations

# PART 2 PRODUCTS

## 2.1 LIGHTING FIXTURE SUPPORTS

Lighting fixtures and supports shall conform to UL 1598 or JIS C 8105-2

## 2.2 SWAY BRACING MATERIALS

Sway bracing materials shall conform with the following:

a. Plates, rods, and rolled shapes, JIS G 3101, JIS G 3106, JIS G 3114, JIS G 3136.

b. Wire rope, JIS G 3549, stainless steel (SUS304), 7x7 construction. A

minimum of two clamps are required on each end of wire rope.

c. Tubes, JIS G 3444, JIS G 3475

d. Pipes, JIS G 3444, JIS G 3466.

e. Angles, JIS G 3101, JIS G 3106, JIS G 3114, JIS G 3136.

f. Other profiles, such as channel struts with in-turned lips and associated hardware for fastening to struts at random points having been approved by the Minister of Land, Infrastructure, Transport and Tourism as a seismic restraint method of which safety has been confirmed by structural calculations that conform with criteria specified in the BSLJ.

# PART 3 EXECUTION

## 3.1 SWAY BRACES FOR CONDUIT

Conduit shall be braced as for an equivalent weight pipe.

## 3.2 ANCHOR BOLTS

Anchor bolts materials and installation shall be in accordance with Section 13 48 73 SEISMIC AND ANTITERRORISM BRACING FOR MISCELLANEOUS EQUIPMENT.

## 3.3 LIGHTING FIXTURES IN BUILDINGS

Lighting fixtures and supports shall conform to the following:

### 3.3.1 Pendant Fixtures

Seismic protection of pendant fixtures shall conform to the requirements of this Specification section.

### 3.3.2 Ceiling Attached Fixtures

#### 3.3.2.1 Recessed Fixtures

Recessed fluorescent individual or continuous-row mounted fixtures shall be supported by a seismic-resistant suspended ceiling support system built in accordance with ASTM E580/E580M or applicable provisions of the BSLJ. Seismic protection for the fixtures shall conform to the requirements of this Specification section. Recessed lighting fixtures less than 25 kg may be supported by and attached directly to the ceiling system runners using screws or bolts, number and size as required by the seismic design. Fixture accessories, including louvers, diffusers, and lenses shall have lock or screw attachments.

#### 3.3.2.2 Surface-Mounted Fixtures

Surface-mounted fluorescent individual or continuous-row fixtures shall be attached to a seismic-resistant ceiling support system built in accordance with ASTM E580/E580M or applicable provisions of the BSLJ. Seismic protection for the fixtures shall conform to the requirements of this Specification section.

### 3.3.3 Assembly Mounted on Outlet Box

A supporting assembly, that is intended to be mounted on an outlet box, shall be designed to accommodate mounting features on 100 mm boxes, plaster rings, and fixture studs.

### 3.3.4 Wall-Mounted Emergency Light Unit

Attachments for wall-mounted emergency light units shall be designed and secured for the worst expected seismic disturbance at the site.

-- End of Section --

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SECTION 26 12 19.10

THREE-PHASE, LIQUID-FILLED PAD-MOUNTED TRANSFORMERS
**05/19**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Contractor may substitute compatible Japan Industrial Standard (JIS) or Japan Architectural Standard Specification (JASS) for non-Japanese standards, as approved by the Contracting Officer's representative.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM A240/A240M | (2018) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications |
| ASTM C260/C260M | (2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete |
| ASTM D1535 | (2014; R 2018) Standard Practice for Specifying Color by the Munsell System |
| ASTM D877/D877M | (2013) Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes |
| ASTM D92 | (2012a) Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester |
| ASTM D97 | (2017b) Standard Test Method for Pour Point of Petroleum Products |

FM GLOBAL (FM)

| | |
|---|---|
| FM APP GUIDE | (updated on-line) Approval Guide http://www.approvalguide.com/ |

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE 386 | (2016) Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV |
| IEEE C2 | (2023) National Electrical Safety Code |
| IEEE C37.47 | (2011) Standard for High Voltage Distribution Class Current-Limiting Type Fuses and Fuse Disconnecting Switches |

| | |
|---|---|
| IEEE C57.12.00 | (2015) General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers |
| IEEE C57.12.28 | (2014) Standard for Pad-Mounted Equipment - Enclosure Integrity |
| IEEE C57.12.29 | (2014) Standard for Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments |
| IEEE C57.12.34 | (2015) Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High Voltage, 34.5 kV Nominal System Voltage and Below; Low Voltage, 15 kV Nominal System Voltage and Below |
| IEEE C57.12.80 | (2010) Standard Terminology for Power and Distribution Transformers |
| IEEE C57.12.90 | (2015; Corr 2017) Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers |
| IEEE C57.98 | (2011) Guide for Transformer Impulse Tests |
| IEEE C62.11 | (2012) Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV) |
| IEEE Stds Dictionary | (2009) IEEE Standards Dictionary: Glossary of Terms & Definitions |

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

| | |
|---|---|
| NETA ATS | (2017; Errata 2017) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems |

JAPAN ELECTRICAL SAFETY INSPECTION ASSOCIATIONS

| | |
|---|---|
| Denki Hoan Kyoukai | Japan Standard for Acceptance Testing and Inspections |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT DSKKS | Denki Setsubi Kouji Kanri Shishin (DSKKS) Electrical Construction Supervision Guidelines |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS C 0365 | (2007) Protection Against Electric Shock - Common Aspects for Installation and Equipment |

| | |
|---|---|
| JIS C 60364-5-54 | (2006) Building Electrical Equipment-Part 5-54: Selection Of Electrical Equipment and Contruction-Grounding Equipment, Protective Conductor and Protective Bonding Conductor |
| JIS Z 9101 | (2018) Graphical symbols -- Safety colours and safety signs -- Part 1: Design principles for safety signs and safety markings |

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

| | |
|---|---|
| NEMA 260 | (1996; R 2004) Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas |
| NEMA Z535.4 | (2011; R 2017) Product Safety Signs and Labels |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 70 | (2023) National Electrical Code |
| NFPA 70E | (2024) Standard for Electrical Safety in the Workplace |

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

| | |
|---|---|
| OECD Test 203 | (1992) Fish Acute Toxicity Test |

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
|---|---|
| EPA 712-C-98-075 | (1998) Fate, Transport and Transformation Test Guidelines - OPPTS 835.3100- "Aerobic Aquatic Biodegradation" |
| EPA 821-R-02-012 | (2002) Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 10 CFR 431 | Energy Efficiency Program for Certain Commercial and Industrial Equipment |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 467 | (2013; Reprint Jun 2017) UL Standard for Safety Grounding and Bonding Equipment |

## 1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined in IEEE Stds Dictionary.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Pad-mounted Transformer Drawings; G

SD-03 Product Data

Pad-mounted Transformers; G

SD-06 Test Reports

Acceptance Checks and Tests;

SD-07 Certificates

Transformer Efficiencies;

SD-10 Operation and Maintenance Data

Transformer(s), Data Package 5;

### 1.3.1 Government Submittal Review

Code CI44, NAVFAC LANT, Naval Facilities Engineering Command will review and approve all submittals in this section requiring Government approval.

### 1.3.2 Reduced Submittal Requirements

Transformers designed and manufactured by ABB in Jefferson City, MO; by Easton's Cooper Power Series Transformers in Waukesha, WI; by ERMCO in Dyersburg, TN; or by Howard Industries in Laurel, MS need not submit the entire submittal package requirements of this contract. Instead, submit the following items:

a. A certification, signed by the manufacturer, stating that the manufacturer will meet the technical requirements of this specification.

b. An outline drawing of the transformer with devices identified (paragraph PAD-MOUNTED TRANSFORMER DRAWINGS, item a).

c. ANSI nameplate data of the transformer (paragraph PAD-MOUNTED TRANSFORMER DRAWINGS, item b).

e. Provide transformer test schedule and routine and other tests required by submittal item "SD-09 Manufacturer's Field Reports".

f. Provide acceptance test reports required by submittal item "SD-06 Test Reports".

g. Provide operation and maintenance manuals required by submittal item

"SD-10 Operation and Maintenance Data".

## 1.4 QUALITY ASSURANCE

### 1.4.1 Pad-Mounted Transformer Drawings

Include the following as a minimum:

a. An outline drawing, including front, top, and side views.

b. IEEE nameplate data.

c. Elementary diagrams and wiring diagrams with terminals identified of watthour meter and current transformers.

d. One-line diagram, including switch(es), current transformers, meters, and fuses.

### 1.4.2 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, except of NFPA 70 when more stringent requirements are specified or indicated, as though the word "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with NFPA 70 unless more stringent requirements are specified or indicated.

### 1.4.3 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship, and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

#### 1.4.3.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

#### 1.4.3.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site are not acceptable.

## 1.5 MAINTENANCE

### 1.5.1 Additions to Operation and Maintenance Data

Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and as specified herein. In addition to requirements of Data Package 5, include the following on the actual transformer(s) provided:

a. An instruction manual with pertinent items and information highlighted

b. An outline drawing, front, top, and side views

c. Prices for spare parts and supply list

d. Routine and field acceptance test reports

e. Fuse curves for primary fuses

f. Information on watthour demand meter, CT's, and fuse block

g. Actual nameplate diagram

h. Date of purchase

# PART 2 PRODUCTS

## 2.1 PRODUCT COORDINATION

Products and materials not considered to be pad-mounted transformers and related accessories are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, and Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

## 2.2 THREE-PHASE PAD-MOUNTED TRANSFORMERS

IEEE C57.12.34, IEEE C57.12.28 and as specified herein. Submit manufacturer's information for each component, device, insulating fluid, and accessory provided with the transformer.

### 2.2.1 Compartments

Provide high- and low-voltage compartments separated by steel isolating barriers extending the full height and depth of the compartments. Compartment doors: hinged lift-off type with stop in open position and three-point latching.

#### 2.2.1.1 High Voltage, Dead-Front

High-voltage compartment contains: the incoming line, insulated high-voltage load-break connectors, bushing well inserts, feed-thru inserts, six high-voltage one-piece bushings configured for loop feed application, load-break switch handle(s), access to oil-immersed bayonet fuses, dead-front surge arresters, tap changer handle, connector parking stands with insulated standoff bushings, protective caps, and ground pad.

Minimum high-voltage compartment dimensions: IEEE C57.12.34, Figures 16 and 17.

a. Insulated high-voltage load-break connectors: IEEE 386, rated 15 kV, 95 kV BIL. Current rating: 200 amperes rms continuous. Short time rating: 10,000 amperes rms symmetrical for a time duration of 0.17 seconds. Connector must have a steel reinforced hook-stick eye, grounding eye, test point, and arc-quenching contact material.

b. Bushing well inserts and feed-thru inserts: IEEE 386, 200 amperes, 15 kV Class. Provide a bushing well insert for each bushing well unless indicated otherwise. Provide feed-thru inserts as indicated.

c. One-piece bushings: IEEE 386, 200 amperes, 15 kV Class.

d. Load-break switch

Loop feed sectionalizer switches: Provide three, two-position, oil-immersed type switches to permit closed transition loop feed and sectionalizing. Each switch must be rated at 15 kV, 95 kV BIL, with a continuous current rating and load-break rating of 200 amperes, and a make-and-latch rating of 12,000 rms amperes symmetrical. Locate the switch handles in the high-voltage compartment. Operation of switches must be as follows:

| ARRANGEMENT NO. | DESCRIPTION OF SWITCH ARRANGEMENT | SWITCH POSITION | | | | | |
|---|---|---|---|---|---|---|---|
| | | LINE A SW. | | LINE B SW | | XFMR. SW | |
| | | OPEN | CLOSE | OPEN | CLOSE | OPEN | CLOSE |
| 1 | Line A connected to Line B and both lines connected to transformer | | X | | X | | X |
| 2 | Transformer connected to Line A only | | X | X | | | X |
| 3 | Transformer connected to Line Bonly | X | | | X | | X |
| 4 | Transformer open and loop closed | | X | | X | X | |
| 5 | Transformer open and loop open | X | | X | | X | |

e. Provide bayonet oil-immersed, expulsion fuses in series with oil-immersed, partial-range, current-limiting fuses. The bayonet fuse links sense both high currents and high oil temperature in order to provide thermal protection to the transformer. Coordinate transformer protection with expulsion fuse clearing low-current faults and current-limiting fuse clearing high-current faults beyond the interrupting rating of the expulsion fuse. Include an oil retention valve inside the bayonet assembly housing, which closes when the fuse holder is removed, and an external drip shield to minimize oil spills. Display a warning label adjacent to the bayonet fuse(s)

cautioning against removing or inserting fuses unless the transformer has been de-energized and the tank pressure has been released.

Bayonet fuse assembly: 150 kV BIL.

Oil-immersed current-limiting fuses: IEEE C37.47; 50,000 rms amperes symmetrical interrupting rating at the system voltage specified.

f. Surge arresters: IEEE C62.11, rated 15 kV, fully shielded, dead-front, metal-oxide-varistor, elbow type with resistance-graded gap. Provide three arresters for loop feed circuits.

g. Parking stands: Provide a parking stand near each bushing. Provide insulated standoff bushings for parking of energized high-voltage connectors on parking stands.

h. Protective caps: IEEE 386, 200 amperes, 15 kV Class. Provide insulated protective caps (not shipping caps) for insulating and sealing out moisture from unused bushings.

2.2.1.2 Low Voltage

Low-voltage compartment contains: low-voltage bushings with NEMA spade terminals, accessories, metering, stainless steel or laser-etched anodized aluminum diagrammatic transformer nameplate, and ground pad.

a. Include the following accessories: drain valve with sampler device, fill plug, pressure relief device, liquid level gage, pressure-vacuum gage, and dial type thermometer with maximum temperature indicator.

2.2.2 Transformer

a. Less-flammable oil-insulated, two winding, 60 hertz, 65 degrees C rise above a 30 degrees C average ambient, self-cooled type.

b. Transformer rated 2,000 kVA.

c. Transformer voltage ratings: 13.800 V 208 - 120 V

d. Tap changer: externally operated, manual type for changing tap setting when the transformer is de-energized. Provide four 2.5 percent full capacity taps, two above and two below rated primary voltage. Indicate which tap setting is in use, clearly visible when the compartment is opened.

e. Minimum tested percent impedance at 85 degrees C:

2.50 for units rated 75kVA and below
2.87 for units rated 112.5kVA to 300kVA
4.03 for 500kVA rated units
5.32 for units rated 750kVA and above

f. Comply with the following audible sound level limits:

| kVA | DECIBELS (MAX |
|---|---|

| | |
|---|---|
| 75 | 51 |
| 112.5 | 55 |
| 150 | 55 |
| 225 | 55 |
| 300 | 55 |
| 500 | 56 |
| 750 | 57 |
| 1000 | 58 |
| 1500 | 60 |
| 2000 | 61 |
| 2500 | 62 |

g. Include:

(1) Lifting lugs and provisions for jacking under base, with base construction suitable for using rollers or skidding in any direction.

2.2.2.1 Specified Transformer Efficiencies

Provide transformer efficiency calculations utilizing the actual no-load and load loss values obtained during the routine tests performed on the actual transformer(s) prepared for this project. Reference no-load losses (NLL) at 20 degrees C. Reference load losses (LL) at 55 degrees C and at 50 percent of the nameplate load. The transformer is not acceptable if the calculated transformer efficiency is less than the efficiency indicated in the "KVA / Efficiency" table below. The table is based on requirements contained within 10 CFR 431, Subpart K. Submit certification, including supporting calculations, from the manufacturer indicating conformance.

| kVA | EFFICIENCY (percent) |
|---|---|
| 15 | 98.65 |
| 30 | 98.83 |
| 45 | 98.92 |
| 75 | 99.03 |
| 112.5 | 99.11 |

| | |
|---|---|
| 150 | 99.16 |
| 225 | 99.23 |
| 300 | 99.27 |
| 500 | 99.35 |
| 750 | 99.40 |
| 1000 | 99.43 |
| 1500 | 99.48 |
| 2000 | 99.51 |
| 2500 | 99.53 |
| above 2500 | 99.54 |

2.2.3 Insulating Liquid

a. Less-flammable transformer liquids: NFPA 70 and FM APP GUIDE for less-flammable liquids having a fire point not less than 300 degrees C tested per ASTM D92 and a dielectric strength not less than 33 kV tested per ASTM D877/D877M. Provide identification of transformer as "non-PCB" and "manufacturer's name and type of fluid" on the nameplate.

Provide a fluid that is a biodegradable, electrical insulating, and cooling liquid classified by UL and approved by FM as "less flammable" with the following properties:

(1) Pour point: ASTM D97, less than -15 degree C

(2) Aquatic biodegradation: EPA 712-C-98-075, ultimately biodegradable as designated by EPA.

(3) Trout toxicity: OECD Test 203, zero mortality of EPA 821-R-02-012, pass

2.2.3.1 Liquid-Filled Transformer Nameplates

Provide nameplate information in accordance with IEEE C57.12.00 and as modified or supplemented by this section. Include the following information on the transformer nameplate: "PCB CONTENT LESS THAN 0.1 PPM AT TIME OF MANUFACTURE."

2.2.4 Corrosion Protection

Provide corrosion resistant bases and cabinets of transformers, fabricated of stainless steel conforming to ASTM A240/A240M, Type 304 or 304L. Base includes any part of pad-mounted transformer that is within 75 mm of concrete pad.

Paint entire transformer assembly Munsell 7GY3.29/1.5 green, with paint coating system complying with IEEE C57.12.28 and IEEE C57.12.29 regardless of base, cabinet, and tank material. The Munsell color notation is specified in ASTM D1535.

## 2.3 WARNING SIGNS AND LABELS

Provide warning signs for the enclosures of pad-mounted transformers having a nominal rating exceeding 600 volts in accordance with NEMA Z535.4 and NEMA 260.

a. When the enclosure integrity of such equipment is specified to be in accordance with IEEE C57.12.28, such as for pad-mounted transformers, provide self-adhesive warning labels (decals, Panduit No. PPSO710D72 or approved equal) on the outside of the high voltage compartment door(s)with nominal dimensions of 178 by 255 mm with the legend "WARNING HIGH VOLTAGE" printed in two lines of nominal 50 mm high letters. Include the work "WARNING" in white letters on an orange background and the words "HIGH VOLTAGE" in black letters on a white background.

b. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 355 by 255 mm with the legend "WARNING HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 75 mm high white letters on an orange and black field.

## 2.4 ARC FLASH WARNING LABEL

Provide warning label of potential electrical arc flash hazards for the enclosure of pad-mounted transformers in accordance with NFPA 70E or JIS Z 9101.

## 2.5 GROUNDING AND BONDING

UL 467 or JIS C 60364-5-54. Provide grounding and bonding as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

## 2.6 PADLOCKS

Provide padlocks for pad-mounted equipment and for each fence gate, keyed alike as directed by the Contracting Officer. Comply with Section 08 71 00 DOOR HARDWARE.

## 2.7 CAST-IN-PLACE CONCRETE

Provide concrete associated with electrical work for other than encasement of underground ducts rated for 30 MPa minimum 28-day compressive strength unless specified otherwise. Conform to the requirements of Section 03 30 53MISCELLANEOUS CAST-IN-PLACE CONCRETE.

Provide concrete associated with electrical work as follows:

a. Composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture.

b. Fine aggregate: hard, dense, durable, clean, and uncoated sand.

c. Coarse aggregate: reasonably well graded from 4.75 mm to 25 mm.

d. Fine and coarse aggregates: free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances.

e. Water: fresh, clean, and free from salts, alkali, organic matter, and other impurities.

f. Concrete associated with electrical work for other than encasement of underground ducts: 30 MPa minimum 28-day compressive strength unless specified otherwise.

g. Slump: Less than 100 mm. Retempering of concrete will not be permitted.

h. Exposed, unformed concrete surfaces: smooth, wood float finish.

i. Concrete must be cured for a period of not less than 7 days, and concrete made with high early strength portland cement must be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Contracting Officer.

j. Air entrain concrete exposed to weather using an air-entraining admixture conforming to ASTM C260/C260M.

k. Air content: between 4 and 6 percent.

## 2.8 SOURCE QUALITY CONTROL

### 2.8.1 Transformer Test Schedule

The Government reserves the right to witness tests. Provide transformer test schedule for tests to be performed at the manufacturer's test facility. Any/all associated costs related to Government personnel travel to witness testing will be solely at the government's expense. Submit required test schedule and location, and notify the Contracting Officer 30 calendar days before scheduled test date. Notify Contracting Officer 15 calendar days in advance of changes to scheduled date.

a. Test Instrument Calibration

(1) Provide a calibration program which assures that all applicable test instruments are maintained within rated accuracy.

(2) Accuracy: Traceable to the National Institute of Standards and Technology.

(3) Instrument calibration frequency schedule: less than or equal to 12 months for both test floor instruments and leased specialty equipment.

(4) Dated calibration labels: visible on all test equipment.

(5) Calibrating standard: higher accuracy than that of the instrument tested.

(6) Keep up-to-date records that indicate dates and test results of instruments calibrated or tested. For instruments calibrated by the manufacturer on a routine basis, in lieu of third party

calibration, include the following:

(a) Maintain up-to-date instrument calibration instructions and procedures for each test instrument.

(b) Identify the third party/laboratory calibrated instrument to verify that calibrating standard is met.

2.8.2 Design Tests

IEEE C57.12.00, and IEEE C57.12.90. Section 5.1.2 in IEEE C57.12.80 states that "design tests are made only on representative apparatus of basically the same design." Submit design test reports (complete with test data, explanations, formulas, and results), in the same submittal package as the catalog data and drawings for each of the specified transformer(s), with design tests performed prior to the award of this contract.

a. Tests: certified and signed by a registered professional engineer.

b. Temperature rise: "Basically the same design" for the temperature rise test means a pad-mounted transformer with the same coil construction (such as wire wound primary and sheet wound secondary), the same kVA, the same cooling type (KNAN), the same temperature rise rating, and the same insulating liquid as the transformer specified.

c. Lightning impulse: "Basically the same design" for the lightning impulse dielectric test means a pad-mounted transformer with the same BIL, the same coil construction (such as wire wound primary and sheet wound secondary), and a tap changer, if specified. Design lightning impulse tests includes the primary windings only of that transformer.

(1) IEEE C57.12.90, paragraph 10.3 entitled "Lightning Impulse Test Procedures," and IEEE C57.98.

(2) State test voltage levels.

(3) Provide photographs of oscilloscope display waveforms or plots of digitized waveforms with test report.

d. Lifting and moving devices: "Basically the same design" requirement for the lifting and moving devices test means a test report confirming that the lifting device being used is capable of handling the weight of the specified transformer in accordance with IEEE C57.12.34.

e. Pressure: "Basically the same design" for the pressure test means a pad-mounted transformer with a tank volume within 30 percent of the tank volume of the transformer specified.

f. Short circuit: "Basically the same design" for the short circuit test means a pad-mounted transformer with the same kVA as the transformer specified.

2.8.3 Routine and Other Tests

IEEE C57.12.00. Routine and other tests: performed in accordance with IEEE C57.12.90 by the manufacturer on each of the actual transformer(s) prepared for this project to ensure that the design performance is maintained in production. Submit test reports, by serial number and

receive approval before delivery of equipment to the project site. Required tests and testing sequence as follows:

a. Phase relation

b. Ratio

c. No-load losses (NLL) and excitation current

d. Load losses (LL) and impedance voltage

e. Dielectric

(1) Impulse

(2) Applied voltage

(3) Induced voltage

f. Leak

# PART 3 EXECUTION

## 3.1 INSTALLATION

Conform to IEEE C2, JIS C 0365, NFPA 70, and to the requirements specified herein. Provide new equipment and materials unless indicated or specified otherwise.

## 3.2 GROUNDING

NFPA 70 and IEEE C2, except provide grounding systems with a resistance to solid earth ground not exceeding 10 ohms.

### 3.2.1 Grounding Electrodes

Provide driven ground rods as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Connect ground conductors to the upper end of ground rods by exothermic weld or compression connector. Provide compression connectors at equipment end of ground conductors.

### 3.2.2 Pad-Mounted Transformer Grounding

Provide a ground ring around the transformer with 100 sqmm bare copper. Provide four ground rods in the ground ring, one per corner. Install the ground rods at least 3000 mm apart from each other. Provide separate copper grounding conductors and connect them to the ground loop as indicated. When work in addition to that indicated or specified is required to obtain the specified ground resistance, the provision of the contract covering "Changes" applies.

### 3.2.3 Connections

Make joints in grounding conductors and loops by exothermic weld or compression connector. Install exothermic welds and compression connectors as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

### 3.2.4 Grounding and Bonding Equipment

UL 467 or JIS C 60364-5-54, except as indicated or specified otherwise.

## 3.3 INSTALLATION OF EQUIPMENT AND ASSEMBLIES

Install and connect pad-mounted transformers furnished under this section as indicated on project drawings, the approved shop drawings, and as specified herein.

## 3.4 FIELD APPLIED PAINTING

Where field painting of enclosures is required to correct damage to the manufacturer's factory applied coatings, provide manufacturer's recommended coatings and apply in accordance with manufacturer's instructions.

## 3.5 FOUNDATION FOR EQUIPMENT AND ASSEMBLIES

Mount transformer on concrete slab as follows:

a. Unless otherwise indicated, provide the slab with dimensions at least 200 mm thick, reinforced with a 152 by 152 mm MW19 by MW19 mesh placed uniformly 100 mm from the top of the slab.

b. Place slab on a 150 mm thick, well-compacted gravel base.

c. Install slab such that top of concrete slab is approximately 100 mm above the finished grade with gradual slope for drainage.

d. Provide edges above grade with 15 mm chamfer.

e. Provide slab of adequate size to project at least 200 mm beyond the equipment.

Stub up conduits, with bushings, 50 mm into cable wells in the concrete pad. Coordinate dimensions of cable wells with transformer cable training areas.

### 3.5.1 Cast-In-Place Concrete

Provide cast-in-place concrete work in accordance with the requirements of Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE.

## 3.6 FIELD QUALITY CONTROL

### 3.6.1 Performance of Acceptance Checks and Tests

A First Class Construction Electric Management Engineer (1 Kyu Dekikouji Sekou Kanrigishi) shall perform acceptance checks and testing in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS or Denki Hoan Kyoukai and MLIT DSKKS. Submit reports, including acceptance criteria and limits for each test in accordance with NETA ATS "Test Values" or Denki Hoan Kyoukai "Test Report".

#### 3.6.1.1 Pad-Mounted Transformers

a. Visual and mechanical inspection

(1) Compare equipment nameplate data with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition. Check for damaged or cracked insulators and leaks.

(3) Inspect anchorage, alignment, and grounding.

(4) Verify the presence of PCB content labeling.

(5) Verify the bushings and transformer interiors are clean.

(6) Inspect all bolted electrical connections for high resistance using low-resistance ohmmeter, verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey.

(7) Verify correct liquid level in tanks and bushings.

(8) Verify that positive pressure is maintained on gas-blanketed transformers.

(9) Perform specific inspections and mechanical tests as recommended by manufacturer.

(10) Verify de-energized tap changer position is left as specified.

(11) Verify the presence of transformer surge arresters.

b. Electrical tests

(1) Perform resistance measurements through all bolted connections with low-resistance ohmmeter.

(2) Verify proper secondary voltage phase-to-phase and phase-to-neutral after energization and prior to loading.

(3) Perform insulation-resistance tests, winding-to-winding and each winding-to-ground. Calculate polarization index. Verify that the tap changer is set at the specified ratio.

(4) Perform turns-ratio tests at all tap positions.

(5) Perform insulation power-factor or dissipation-factor tests on all windings in accordance with test equipment manufacturer’s published data.

(6) Perform power-factor or dissipation-factor tests on each bushing equipped with a power-factor/capacitance tap. In the absence of a power-factor/capacitance tap, perform hot-collar tests.

(7) Measure the resistance of each high-voltage winding in each de-energized tap-changer position. Measure the resistance of each low-voltage winding in each de-energized tap-changer position, if applicable.

(8) Remove and test a sample of insulating liquid for the following: Dielectric breakdown voltage, Acid neutralization number, Specific

gravity, Interfacial tension, Color, Visual Condition, Water in insulating liquids (Required on 25 kV or higher voltages and on all silicone-filled units.), and Power factor or dissipation factor.

(9) Perform dissolved-gas analysis (DGA) on a sample of insulating liquid.

3.6.1.2 Current Transformers

a. Visual and mechanical inspection

(1) Compare equipment nameplate data with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition.

(3) Verify correct connection.

(4) Verify that adequate clearances exist between primary and secondary circuit wiring.

(5) Verify the unit is clean.

(6) Inspect all bolted electrical connections for high resistance using low-resistance ohmmeter, verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey.

(7) Verify that all required grounding and shorting connections provide good contact.

(8) Verify correct operation of transformer withdrawal mechanism and grounding operation.

(9) Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

b. Electrical tests

(1) Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable.

(2) Perform insulation-resistance test.

(3) Perform a polarity test.

(4) Perform a ratio-verification test.

3.6.1.3 Watthour Meter

a. Visual and mechanical inspection

(1) Compare equipment nameplate data with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition.

(3) Verify tightness of electrical connections.

b. Electrical tests

(1) Calibrate watthour meters according to manufacturer's published data.

(2) Verify that correct multiplier has been placed on face of meter, where applicable.

(3) Verify that current transformer secondary circuits are intact.

3.6.1.4 Grounding System

a. Visual and mechanical inspection

(1) Inspect ground system for compliance with contract plans and specifications.

b. Electrical tests

(1) Perform ground-impedance measurements utilizing the fall-of-potential method. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable ground resistance tester in accordance with manufacturer's instructions to test each ground or group of grounds. Use an instrument equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

(2) Submit the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system. Include the test method and test setup (i.e., pin location) used to determine ground resistance and soil conditions at the time the measurements were made.

3.6.1.5 Surge Arresters, High- and Extra-High-Voltage

a. Visual and mechanical inspection

(1) Compare equipment nameplate data with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition.

(3) Inspect anchorage, alignment, grounding, and clearances.

(4) Verify the arresters are clean.

(5) Inspect all bolted electrical connections for high resistance using low-resistance ohmmeter, verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey.

(6) Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.

b. Electrical tests

(1) Perform resistance measurements through all bolted connections with low-resistance ohmmeter, if applicable.

(2) Perform an insulation-resistance test on each arrester, phase terminal-to-ground.

(3) Test grounding connection.

3.6.2 Follow-Up Verification

Upon completion of acceptance checks and tests, show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, notify the Contracting Officer 5 working days in advance of the dates and times of checking and testing.

-- End of Section --

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# SECTION 26 20 00

# INTERIOR DISTRIBUTION SYSTEM
**02/14**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Contractor may substitute compatible Japan Industrial Standard (JIS), Ministry of Land, Infrastructure and Transport (MLIT), Japan Electrical Safety Inspection Associations, Japanese Electrotechnical Committee (JEC) or Japan Wire Industry Association (JCS) standards for non-Japanese standards, as approved by the Contracting Officer's representative.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE C2 | (2023) National Electrical Safety Code |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS C 0365 | (2007) Protection Against Electric Shock - Common Aspects for Installation and Equipment |
| JIS C 0920 | (2003) Degrees Of Protection Provided By Enclosures (IP Code) |
| JIS C 1210 | (1979) General Rules for Electricity Meters |
| JIS C 2336 | (2012) Pressure-sensitive polyvinyl chloride tapes for electrical purposes |
| JIS C 2338 | (2012) Polyester adhesive tape for electrical insulation |
| JIS C 2805 | (2010) Crimp terminal for copper wire |
| JIS C 2806 | (2003) Bare crimping sleeve for copper wire |
| JIS C 2810 | (1995) General rules on non-separable type wire connectors for interior wiring |
| JIS C 3101 | (1994) Hard-drawn copper wires for electrical purposes |
| JIS C 3105 | (1994) Hard-drawn copper stranded conductors |
| JIS C 3401 | (2002) Control Cables |
| JIS C 3605 | (R2002) 600 V Polyethylene Insulated Cables, Type CV |

| | |
|---|---|
| JIS C 3612 | (2002) 600V Flame Retardant Polyethylene Insulated Wires |
| JIS C 5381-11 | (2014) Low-voltage surge protective devices -- Part 11: Surge protective devices connected to low-voltage power systems -- Requirements and test methods |
| JIS C 5381-12 | (2014) Low-voltage surge protective devices -- Part 12: Surge protective devices connected to low-voltage power distribution systems -- Selection and application principles |
| JIS C 8201-2-1 | (2011) Low-Voltage Switchgear and Control Gear - Part 2-1: Circuit-Breakers |
| JIS C 8201-2-2 | (2011) Low-Voltage Switchgear and Control Gear - Part 2-2: Circuit-Breakers |
| JIS C 8201-3 | (2009) Low-voltage switchgear and control units-Part 3: Switches,Disconnector, disconnecting switch and fuse assembly unit |
| JIS C 8222 | (2004) Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) |
| JIS C 8281-1 | (2019) Plugs and socket-outlets for household and similar purposes -- Part 1: General requirements |
| JIS C 8303 | (2007) Plugs And Receptacles For Domestic And Similar General Use |
| JIS C 8304 | (2009) Small switches for indoor use |
| JIS C 8305 | (2019) Rigid Steel Conduits |
| JIS C 8309 | (2019) Pliable metal conduits |
| JIS C 8330 | (1999) Fittings for rigid metal conduits |
| JIS C 8340 | (1999)Boxes And Box Covers For Rigid Metal Conduits |
| JIS C 8350 | (1999) Fittings for pliable metal conduits |
| JIS C 8380 | (1993) Plastic coated steel pipes for cable-ways |
| JIS C 8430 | (2019) Unplasticized polyvinyl chloride (PVC-U) conduits |
| JIS C 8432 | (2019) Fittings of unplasticized polyvinyl chloride (PVC-U) conduits |
| JIS C 8435 | (2018) Boxes And Box Covers Of Plastic |

| | |
|---|---|
| | Conduits |
| JIS C 8462-1 | (2012) Boxes and enclosures for electrical accessories for household and similar fixed electrical installations -- Part 1: General requirements |
| JIS C 8480 | (R2016) Box-Type Switchgear Assemblies for Low-Voltage Distribution Purpose |
| JIS C 60364-5-54 | (2006) Building Electrical Equipment-Part 5-54: Selection Of Electrical Equipment and Contruction-Grounding Equipment, Protective Conductor and Protective Bonding Conductor |
| JIS K 6743 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipe Fittings for Water Supply |
| JIS K 6911 | (2006) Thermosetting plastic general test method |
| JIS K 6741 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipes |
| JIS Z 9290-1 | (2014) Protection Against Lightning - Part 1: General Principles |

JAPAN WIRE INDUSTRY ASSOCIATION STANDARD (JCS)

| | |
|---|---|
| JCS 1226 | (2003) Soft Stranded Wire |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT ESS | (2019) MLIT Electrical Standard Specification (ESS) |

## 1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Panelboards; G

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Identify circuit

terminals on wiring diagrams and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Indicate on the drawings adequate clearance for operation, maintenance, and replacement of operating equipment devices.

SD-03 Product Data

Receptacles

Circuit breakers; G

Switches; G

Surge protective devices; G

Wires And Cables

SD-06 Test Reports

600-volt wiring test;

Grounding system test;

Ground-fault receptacle test;

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5

Metering

Submit operation and maintenance data in accordance with Section 01 78 23, OPERATION AND MAINTENANCE DATA and as specified herein.

## 1.4 QUALITY ASSURANCE

### 1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of applicable codes and standards unless more stringent requirements are specified or indicated.

### 1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements,

manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site are not acceptable.

1.5 MAINTENANCE

1.5.1 Electrical Systems

Submit operation and maintenance manuals for electrical systems that provide basic data relating to the design, operation, and maintenance of the electrical distribution system for the building. Include the following:

a. Single line diagram of the "as-built" building electrical system.

b. Schematic diagram of electrical control system (other than HVAC, covered elsewhere).

c. Manufacturers' operating and maintenance manuals on active electrical equipment.

1.6 WARRANTY

Provide equipment items supported by service organizations that are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

As a minimum, meet requirements of UL or Japanese standards, where UL or applicable Japanese codes and standards are established for those items for all materials, equipment, and devices.

2.2 CONDUIT AND FITTINGS

Conform to the following:

2.2.1 Rigid Metallic Conduit or Type G Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit or Type G

JIS C 8305, Type G. Diameter of conduit shall be as indicated.

2.2.2 Rigid Nonmetallic Conduit or Unplasticized Polyvinyl Chloride

JIS C 8430 for Type VE or HIVE conduit of diameter of less than 100mm and

JIS K 6741 for Type VP or HIVP conduit diameter or 100mm and larger.

2.2.3 Intermediate Metal Conduit (IMC) or Type C

JIS C 8305, Type C, zinc-coated steel only.

2.2.4 Electrical, Zinc-Coated Steel Metallic Tubing (EMT) or Type E Metallic Conduit

JIS C 8305, Type E.

2.2.5 Plastic-Coated Rigid Steel and IMC Conduit or Type G, C or E; LL or LT

JIS C 8380.

2.2.6 Flexible Metal Conduit

JIS C 8309.

2.2.6.1 Liquid-Tight Flexible Metal Conduit, Steel

JIS C 8309.

2.2.7 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

JIS C 8330 and JIS C 8350. Ferrous fittings: cadmium- or zinc-coated in accordance with JIS C 8330 and JIS C 8350.

2.2.7.1 Fittings for Rigid Metal Conduit and IMC or Type G and Type C

Threaded-type. Split couplings unacceptable.

2.2.7.2 Fittings for EMT or Type E Conduit

Steel type.

2.2.8 Fittings for Rigid Nonmetallic Conduit or Unplasticized Polyvinyl Chloride

JIS C 8432 for diameters less than 100mm and JIS K 6743 for diameters 100mm or larger.

2.3 OUTLET BOXES AND COVERS

JIS C 8340, cadmium- or zinc-coated, if ferrous metal. JIS C 8435, if nonmetallic. Rated IP65 for wet locations

## 2.4 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 1640 mL, JIS C 8340, hot-dip, zinc-coated, if sheet steel. Rated IP65 for wet locations

## 2.5 WIRES AND CABLES

Provide wires and cables in accordance applicable requirements of Japanese standards for type of insulation, jacket, and conductor specified or indicated. Do not use wires and cables manufactured more than 12 months prior to date of delivery to site.

### 2.5.1 Conductors

Provide the following:

a. Conductor sizes and capacities shown are based on copper, unless indicated otherwise.

b. Conductors 1.25 sqmm and larger diameter: stranded.

c. Conductors 3.2 mm and smaller diameter: solid.

d. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3: stranded unless specifically indicated otherwise.

e. All conductors: copper.

#### 2.5.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to satisfy manufacturer's requirements.

#### 2.5.1.2 Minimum Conductor Sizes

Provide minimum conductor size in accordance with the following:

a. Branch circuits: 2.0 mm.

b. Class 1 remote-control and signal circuits: 1.6 mm.

c. Class 2 low-energy, remote-control and signal circuits: 1.2 mm.

d. Class 3 low-energy, remote-control, alarm and signal circuits: 0.65 mm.

### 2.5.2 Color Coding

Provide color coding for service, feeder, branch, control, and signaling circuit conductors.

#### 2.5.2.1 Ground and Neutral Conductors

Provide color coding of ground and neutral conductors as follows:

a. Grounding conductors: Green.

b. Neutral conductors: White or Gray.

c. Exception, where neutrals of more than one system are installed in same raceway or box, other neutrals color coding: white with a different colored (not green) stripe for each.

2.5.2.2 Ungrounded Conductors

Provide color coding of ungrounded conductors in different voltage systems as follows:

a. 208/120 volt, three-phase, four-wire

(1) Phase A - red

(2) Phase B - black

(3) Phase C - blue

b. 208 volt, three-phase, three-wire

(1) Phase A - red

(2) Phase B - black

(3) Phase C - blue

2.5.3 Insulation

Unless specified or indicated otherwise, provide power and lighting wires rated for 600-volts,Type EM-IE conforming to JIS C 3612 or Type EM-CE, EM-CET or EM-ECEQ conforming to JIS C 3605, except that grounding wire may be type TW conforming to JIS C 3612, Type EM-IE; remote-control and signal circuits: Type TW or TF, conforming to JIS C 3401, Type CEV. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.5.4 Bonding Conductors

JIS C 3101, solid bare copper wire for sizes 8 sqmm and smaller diameter; JIS C 3105 and JCS 1226, Class B, stranded bare copper wire for sizes 14 sqmm and larger diameter.

2.5.5 Polyethylene or Cross-Linked Polyethylene Cable

Type CE conforming to JIS C 3605 for 600V.

2.5.6 Standard Industrial Cables

Type CEE conforming to JIS C 3401 for control.

2.6 SPLICES AND TERMINATION COMPONENTS

JIS C 2805, JIS C 2806 and JIS C 2810 for wire connectors and JIS C 2336, JIS C 2338 for insulating tapes. Connectors for 5.5 sqmm and smaller diameter wires: insulated, pressure-type in accordance with JIS C 2805, JIS C 2806 and JIS C 2810 or JIS C 2806 (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

## 2.7 DEVICE PLATES

Provide the following:

a. UL listed, one-piece device plates for outlets to suit the devices installed.

b. For metal outlet boxes, plates on unfinished walls: zinc-coated sheet steel or cast metal having round or beveled edges.

c. For nonmetallic boxes and fittings, other suitable plates may be provided.

d. Plates on finished walls: nylon or lexan, minimum 0.792 mm wall thickness and same color as receptacle or toggle switch with which they are mounted.

f. Screws: machine-type with countersunk heads in color to match finish of plate.

g. Sectional type device plates are not be permitted.

h. Plates installed in wet locations: gasketed and UL listed for "wet locations."

## 2.8 SWITCHES

### 2.8.1 Toggle Switches

JIS C 8304, single pole, double pole and three-way,, totally enclosed with bodies of thermoplastic or thermoset plastic . Include the following:

a. Handles: white thermoplastic.

b. Wiring terminals: screw-type, side-wired.

c. Contacts: silver-cadmium and contact arm - one-piece copper alloy.

d. Switches: rated quiet-type ac only, 120volts, with current rating and number of poles indicated.

### 2.8.2 Disconnect Switches

JIS C 8201-3. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches.

## 2.9 RECEPTACLES

Provide the following:

a. JIS C 8303, JIS C 8281-1, hard use (also designated heavy-duty), grounding-type.

b. Ratings and configurations: as indicated.

c. Bodies: white.

d. Face and body: thermoplastic supported on a metal mounting strap.

e. Dimensional requirements: per JIS C 8462-1.

f. Screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.

g. Grounding pole connected to mounting strap.

h. The receptacle: containing triple-wipe power contacts and double or triple-wipe ground contacts.

2.9.1 Weatherproof Receptacles

Provide receptacles, UL listed for use in "wet locations" or weather resistant per JIS C 8303. Include cast metal box with gasketed, hinged, lockable and weatherproof while-in-use, polycarbonate, UV resistant/stabilized cover plate.

2.9.2 Ground-Fault Circuit Interrupter Receptacles

Duplex type for mounting in standard outlet box. Provide device capable of detecting current leak of 6 milliamperes or greater and tripping for Class A ground-fault circuit interrupter devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.9.3 Dryer Receptacles

Receptacle configuration as indicated, NEMA 14-30R 30(L-Type) Amps 125/250V Dryer Outlet, Flush Mounting Power Outlet, Straight Blade Heavy Duty Dryer Receptacle, Grounding, 3 Pole 4 Wire, UL Listed. Furnish one matching plug with each receptacle.

2.9.4 Tamper-Resistant Receptacles

Provide duplex receptacle with mechanical sliding shutters that prevent the insertion of small objects into its contact slots.

2.10 PANELBOARDS

Provide panelboards in accordance with the following:

a. JIS C 8480 and JIS C 8480, JIS C 0920 having a short-circuit current rating as indicated of 10,000 amperes symmetrical minimum.

b. Panelboards for use as service disconnecting means: additionally conform to manufacturer's recommendations.

c. Panelboards: circuit breaker-equipped.

d. Designed such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.

e. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings.

f. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise.

g. Main breaker: "separately" mounted "above" or "below" branch breakers.

h. Where "space only" is indicated, make provisions for future installation of breakers.

i. Directories: indicate load served by each circuit in panelboard.

j. Directories: indicate source of service to panelboard (e.g., Panel PA served from Panel MDP).

k. Provide new directories for existing panels modified by this project as indicated.

l. Type directories and mount in holder behind transparent protective covering.

m. Panelboards: listed and labeled for their intended use.

n. Panelboard nameplates: provided in accordance with paragraph FIELD FABRICATED NAMEPLATES.

2.10.1 Enclosure

Provide panelboard enclosure in accordance with the following:

a. JIS C 0920.

b. Cabinets mounted outdoors or flush-mounted: hot-dipped galvanized after fabrication.

c. Cabinets: painted in accordance with paragraph PAINTING.

d. Outdoor cabinets: Weatherproof rated IP code with a removable steel plate 7 mm thick in the bottom for field drilling for conduit connections.

e. Front edges of cabinets: form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front.

f. All cabinets: fabricated such that no part of any surface on the finished cabinet deviates from a true plane by more than 3 mm.

g. Holes: provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a 15 mm clear space between the back of the cabinet and the wall surface.

h. Flush doors: mounted on hinges that expose only the hinge roll to view when the door is closed.

i. Each door: fitted with a combined catch and lock, except that doors over 600 mm long provided with a three-point latch having a knob with a T-handle, and a cylinder lock.

j. Keys: two provided with each lock, with all locks keyed alike.

k. Finished-head cap screws: provided for mounting the panelboard fronts

on the cabinets.

2.10.2 Panelboard Buses

Support bus bars on bases independent of circuit breakers. Design main buses and back pans so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per JIS C 8480 for connecting grounding conductors; bond to steel cabinet. In addition to equipment grounding bus, provide second "isolated" ground bus, where indicated.

2.10.3 Circuit Breakers

JIS C 8201-2-1, thermal magnetic-type, solid state-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker will be mounted. Breaker terminals: UL listed as suitable for type of conductor provided. Where indicated on the drawings, provide circuit breakers with shunt trip devices. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.10.3.1 Multipole Breakers

Provide common trip-type with single operating handle. Design breaker such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.10.3.2 Circuit Breaker With Ground-Fault Circuit Interrupter or Type RCBO

JIS C 8201-2-2. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of JIS C 8201-2-2 for Class A ground-fault circuit interrupter.

2.11 MOTORS

2.11.1 Wiring and Conduit

Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment, as specified herein. Power wiring and conduit: conform to the requirements specified herein. Control wiring: provided under, and conform to, the requirements of the section specifying the associated equipment.

2.12 MANUFACTURER'S NAMEPLATE

Provide on each item of equipment a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.13 FIELD FABRICATED NAMEPLATES

Provide field fabricated nameplates in accordance with the following:

a. JIS K 6911.

b. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.

c. Each nameplate inscription: identify the function and, when applicable, the position.

d. Nameplates: melamine plastic, 3 mm thick, white with black center core.

e. Provide red laminated plastic label with white center core where indicated.

f. Surface: matte finish. Corners: square. Accurately align lettering and engrave into the core.

g. Minimum size of nameplates: 25 by 65 mm.

h. Lettering size and style: a minimum of 6.35 mm high normal block style.

## 2.14 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00, FIRESTOPPING.

## 2.15 METERING

JIS C 1210. Provide a self-contained, socket-mounted, electronic programmable outdoor watthour meter. Meter: either programmed at the factory or programmed in the field. Turn field programming device over to the Contracting Officer at completion of project. Coordinate meter to system requirements.

a. Design: Provide watthour meter designed for use on a single-phase, three-wire, 240/120 volt system. Include necessary KYZ pulse initiation hardware for Energy Monitoring and Control System (EMCS).

b. Cover: Polycarbonate and lockable to prevent tampering and unauthorized removal.

c. Kilowatt-hour Register: five digit electronic programmable type.

## 2.16 SURGE PROTECTIVE DEVICES

Provide surge protective devices (SPD) which comply with JIS C 5381-11 and JIS C 5381-12 at the service entrance. Provide surge protectors in a indoor IP rated enclosure per JIS C 8462-1. Use Type 1 or Type 2 SPD and connect on the load side of a dedicated circuit breaker.

## 2.17 COORDINATED POWER SYSTEM PROTECTION

Prepare analyses as specified in Section 26 28 01.00 10 COORDINATED POWER SYSTEM PROTECTION.

# PART 3 EXECUTION

## 3.1 INSTALLATION

Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces: conform to requirements of MLIT ESS, IEEE C2, JIS C 0365 and to requirements specified herein.

### 3.1.1 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures: labeled and identified as such.

#### 3.1.1.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, label each enclosure, new and existing, as one of several enclosures containing service entrance disconnect devices. Label, at minimum: indicate number of service disconnect devices housed by enclosure and indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels conforming to paragraph FIELD FABRICATED NAMEPLATES. Use lettering of at least 6.35 mm in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure: provided only as permitted.

### 3.1.2 Wiring Methods

Provide insulated conductors installed in rigid steel conduit or type G, IMC or type C, rigid nonmetallic conduit or Unplasticized Polyvinyl Chloride, or EMT or Type E, except where specifically indicated or specified otherwise or required to be installed otherwise. Grounding conductor: separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size: 16 mm in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings: made with metal conduit in fire-rated shafts, with metal conduit extending through shafts for minimum distance of 150 mm. Firestop conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors in accordance with Section 07 84 00, FIRESTOPPING.

#### 3.1.2.1 Pull Wire

Install pull wires in empty conduits. Pull wire: plastic having minimum 890-N force tensile strength. Leave minimum 915 mm of slack at each end of pull wire.

### 3.1.3 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 150 mm away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

#### 3.1.3.1 Restrictions Applicable to EMT or Type E

a. Do not install underground.

b. Do not encase in concrete, mortar, grout, or other cementitious materials.

c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT or Type E conduit.

d. Do not use in hazardous areas.

e. Do not use outdoors.

f. Do not use in fire pump rooms.

g. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.3.2 Conduit Support

Support conduit by pipe straps, wall brackets, threaded rod conduit hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Do not exceed one-fourth proof test load for load applied to fasteners. Provide vibration resistant and shock-resistant fasteners attached to concrete ceiling. Do not cut main reinforcing bars for any holes cut to depth of more than 40 mm in reinforced concrete beams or to depth of more than 20 mm in concrete joints. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Do not share supporting means between electrical raceways and mechanical piping or ducts. Coordinate installationwith above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Support exposed risers in wire shafts of multistory buildings by U-clamp hangers at each floor level and at 3050 mm maximum intervals. Where conduit crosses building expansion joints, provide suitable expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 63 mm inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

3.1.3.3 Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3.1.3.4 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Provide locknuts with sharp edges for digging

into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required.

3.1.3.5 Flexible Connections

Provide flexible steel conduit between 915 and 1830 mm in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size: 16 mm diameter. Provide liquidtight flexible nonmetallic conduit in wet and damp locations and in fire pump rooms for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.

3.1.4 Boxes, Outlets, and Supports

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways: cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when surface mounted on interior walls exposed up to 2135 mm above floors and walkways, and when specifically indicated. Boxes in other locations: sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic sheathed cable conduit system. Provide each box with volume required for number of conductors enclosed in box. Boxes for mounting lighting fixtures: minimum 100 mm square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls: square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; provide readily removable fixturesfor access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 610 mm from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.4.1 Boxes

Boxes for use with raceway systems: minimum 40 mm deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets: minimum 100 mm square, except that 100 by 50 mm boxes may be used where only one raceway enters outlet. Telecommunications outlets: a minimum of 100 mm square by 54 mm deep, except for wall mounted telephones and outlet boxes for handicap telephone stations. Mount outlet boxes flush in finished walls.

3.1.4.2 Pull Boxes

Construct of at least minimum size required except where cast-metal boxes

are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

#### 3.1.4.3 Extension Rings

Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

### 3.1.5 Mounting Heights

Mount panelboards, enclosed circuit breakers, and disconnecting switches so height of operating handle at its highest position is maximum 1980 mm above floor. Mount lighting switches 1220 mm above finished floor. Mount receptacles 460 mm above finished floor, unless otherwise indicated.. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

### 3.1.6 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors 14 sqmm and smaller diameter, provide color coding by factory-applied, color-impregnated insulation. For conductors 22 sqmm and larger diameter, provide color coding by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves.

### 3.1.7 Splices

Make splices in accessible locations. Make splices in conductors 5.5 sqmm and smaller diameter with insulated, pressure-type connector. Make splices in conductors 8 sqmm and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

### 3.1.8 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00 FIRESTOPPING.

### 3.1.9 Grounding and Bonding

Provide in accordance with JIS Z 9290-1. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode. Make ground connection to driven ground rods on exterior of building. In addition to the requirements specified herein, provide telecommunications grounding in accordance with JIS C 60364-5-54. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere

with correct operation of fault protection.

3.1.9.1 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Provide tools and dies as recommended by the manufacturer. Use an embossing die code or other standard method to provide visible indication that a connector has been adequately compressed on the ground wire.

3.1.10 Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications and are provided under the section specifying the associated equipment.

3.1.11 Repair of Existing Work

Perform repair of existing work, demolition, and modification of existing electrical distribution systems as follows:

3.1.11.1 Workmanship

Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

3.1.11.2 Existing Concealed Wiring to be Removed

Disconnect existing concealed wiring to be removed from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

3.1.11.3 Removal of Existing Electrical Distribution System

Removal of existing electrical distribution system equipment includes equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, as indicated.

3.1.11.4 Continuation of Service

Maintain continuity of existing circuits of equipment to remain. Maintain existing circuits of equipment energized. Restore circuits wiring and power which are to remain but were disturbed during demolition back to original condition.

### 3.1.12 Surge Protective Devices

Connect the surge protective devices in parallel to the power source, keeping the conductors as short and straight as practically possible. Maximum allowed lead length is 900 mm.

## 3.2 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

## 3.3 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting: as specified in Section 09 90 00 PAINTS AND COATINGS.Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions.

## 3.4 FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give Contracting Officer 5 working days notice prior to each test.

### 3.4.1 Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

### 3.4.2 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring 14 sqmm and larger diameter using instrument which applies voltage of 1,000 volts DC for 600 volt rated wiring and 500 volts DC for 300 volt rated wiring to provide direct reading of resistance.

### 3.4.3 Ground-Fault Receptacle Test

Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.Test RCBO circuit breakers in accordance with JIS C 8222, Annex G.

### 3.4.4 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Contracting Officer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

### 3.4.5 Phase Rotation Test

Perform phase rotation test to ensure proper rotation of service power prior to operation of new or reinstalled equipment using a phase rotation meter. Follow the meter manual directions performing the test.

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COORDINATED POWER SYSTEM PROTECTION

**08/21**

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COORDINATED POWER SYSTEM PROTECTION
**08/21**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE 242 | (2001; Errata 2003) Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - Buff Book |
| IEEE 399 | (1997) Brown Book IEEE Recommended Practice for Power Systems Analysis |

1.2 SYSTEM DESCRIPTION

The power system covered by this specification consists of: Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fault Current Analysis

Protective Device Coordination Study

PART 2 PRODUCTS

2.1 COORDINATED POWER SYSTEM PROTECTION

Prepare analyses to demonstrate that the equipment selected and system constructed meet the contract requirements for ratings, coordination, and protection. Include a load flow analysis, a fault current analysis, and a protective device coordination study. Submit the study along with protective device equipment submittals. No time extensions or similar contact modifications will be granted for work arising out of the requirements for this study. Approval of protective devices proposed will be based on recommendations of this study. The Government is not responsible for any changes to equipment, device ratings, settings, or additional labor for installation of equipment or devices ordered and/or

procured prior to approval of the study.

2.1.1 Scope of Analyses

The fault current analysis and protective device coordination study must begin at: the source bus and extend down to system buses where fault availability is 10,000 amperes (symmetrical) for building/facility 600 volt level distribution buses.

2.1.2 Single Line Diagram

Prepare a single line diagram to show the electrical system buses, devices, transformation points, and all sources of fault current (including generator and motor contributions). A fault-impedance diagram or a computer analysis diagram may be provided. Each bus, device or transformation point must have a unique identifier. If a fault-impedance diagram is provided, show impedance data. Show location of switches, breakers, and circuit interrupting devices on the diagram together with available fault data, and the device interrupting rating.

2.1.3 Fault Current Analysis

2.1.3.1 Method

Perform the fault current analysis in accordance with methods described in IEEE 242, and IEEE 399.

PART 3 EXECUTION

Not Used

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SECTION 26 51 00

INTERIOR LIGHTING

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# SECTION 26 51 00

# INTERIOR LIGHTING
**05/16**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Contractor may substitute compatible Japan Industrial Standard (JIS), Japan Luminaires Association (JIL) as approved by the Contracting Officer's representative.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE C2 | (2023) National Electrical Safety Code |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS C 0365 | (2007) Protection Against Electric Shock - Common Aspects for Installation and Equipment |
| JIS C 0920 | (2003) Degrees Of Protection Provided By Enclosures (IP Code) |
| JIS C 8105-1 | (2017) Luminaires - Part 1: General Requirements For Safety |
| JIS C 8152-2 | (2012) Measurement method of white light emitting diode (LED) for lighting-Part 2: LED modules and LED light engines |
| JIS C 8152-3 | (2013) Measurement method of white light emitting diode (LED) for lightingPart 3: Measurement of luminous flux maintenance rate |
| JIS C 8154 | (2015) LED modules for general lighting -- Safety specifications |
| JIS C 8155 | (2019) LED modules for general lighting -- Performance requirements |
| JIS C 61000-3-2 | (2019) Electromagnetic compatibility (EMC) -- Part 3-2: Limits -- Limits for harmonic current emissions |
| JIS Z 8113 | (1998) Lighting vocabulary |
| JIS Z 9110 | (2010) General rules of recommended lighting levels |

## 1.2 RELATED REQUIREMENTS

Materials not considered to be luminaires or luminaire accessories are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

## 1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, must be as defined in JIS Z 8113

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Data, drawings, and reports must employ the terminology, classifications and methods prescribed by the JIS Z 9110 as applicable, for the lighting system specified. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Luminaires; G

Light Sources; G

LED Luminaire Warranty

SD-06 Test Reports

Energy Efficiency;

## 1.5 QUALITY CONTROL

### 1.5.1 Luminaire Drawings

Include dimensions, accessories, and installation and construction details. Photometric data, including zonal lumen data, average and minimum ratio, aiming diagram, and must accompany shop drawings.

### 1.5.2 Test Laboratories

Test laboratories for JIS C 8152-2 and JIS C 8152-3 test reports must be a Japan Accredited Laboratory for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program for both LM-79 and LM-80 or JIS C 8152-2 and JIS C 8152-3 testing

### 1.5.3 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of applicable codes and standards, unless more stringent requirements are specified or indicated.

1.5.4 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products must have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the two-year period. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.5.4.2 Material and Equipment Manufacturing Date

Products manufactured more than six months prior to date of delivery to site must not be used, unless specified otherwise.

1.5.4.3 Energy Efficiency

Submit data indicating lumens per watt efficacy and color rendering index of light source.

1.6 WARRANTY

Support all equipment items by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.6.1 LED Luminaire Warranty

a. Provide a written 5 year on-site replacement warranty for material, fixture finish, and workmanship. On-site replacement includes transportation, removal, and installation of new products.

   (1) Include finish warranty to include failure and substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

   (2) Material warranty must include:

      (a) All drivers.

      (b) Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective or non-starting.

b. Warranty period must begin on date of beneficial occupancy. Provide the Contracting Officer with signed warranty certificates prior to

final payment.

# PART 2 PRODUCTS

## 2.1 PRODUCT COORDINATION

Products and materials not considered to be luminaires, luminaire controls, or associated equipment are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

## 2.2 LUMINAIRES

JIS C 8105-1, JIS C 61000-3-2 JIS C 8154 and JIS C 8155. Provide luminaires as indicated in luminaire schedule and NL plates or details on project plans. Provide luminaires complete with light sources of quantity, type, and wattage indicated. Provide all luminaires of the same type by the same manufacturer. Luminaires must be specifically designed for use with the driver, ballast or generator and light source provided.

### 2.2.1 LED Luminaires

Provide luminaires complete with power supplies (drivers) and light sources. Provide design information including lumen output and design life in luminaire schedule on project plans for LED luminaires. LED luminaires must also meet the following minimum requirements:

a. Luminaires must have a minimum 5 year manufacturer's warranty.

b. Luminaire drive current value must be identical to that provided by test data for luminaire in question.

c. Luminaires must be tested to JIS C 8152-2 and JIS C 8152-3, with the results provided as required in the Submittals paragraph of this specification.

## 2.3 LIGHT SOURCES

JIS C 8155. Provide type and wattage as indicated in luminaire schedule on project plans.

### 2.3.1 LED Light Sources

a. Correlated Color Temperature (CCT) of 3500 degrees K.

b. Minimum Color Rendering Index (CRI) value of 80.

c. High power, white light output utilizing phosphor conversion (PC) process or mixed system of colored LEDs, typically red, green and blue (RGB).

d. RoHS compliant.

## 2.4 LIGHTING CONTROLS

Provide lighting controls and associated equipment in accordance with drawings and applicable energy codes.

### 2.4.1 Toggle Switches

Provide line-voltage toggle switches as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

## 2.5 EQUIPMENT IDENTIFICATION

### 2.5.1 Manufacturer's Nameplate

Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

### 2.5.2 Labels

Provide labeled luminaires in accordance with JIS C 8105-1 requirements. All luminaires must be clearly marked for operation of specific light sources and ballasts, generators or drivers. Note the following light source characteristics in the format "Use Only _____":

a. Correlated color temperature (CCT) and color rendering index (CRI) for all luminaires.

All markings related to light source type must be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when light sources are in place. Ballasts, generators or drivers must have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

## 2.6 FACTORY APPLIED FINISH

Provide all luminaires and lighting equipment with factory-applied painting system that as a minimum, meets requirements of JIS C 0920 corrosion-resistance test.

## 2.7 RECESS- AND FLUSH-MOUNTED LUMINAIRES

Provide access to lamp and ballast from bottom of luminaire. Provide trim and lenses for the exposed surface of flush-mounted luminaires as indicated on project drawings and specifications.

# PART 3 EXECUTION

## 3.1 INSTALLATION

Electrical installations must conform to IEEE C2 and JIS C 0365 and to the requirements specified herein. Install luminaires and lighting controls to meet the requirements of applicable codes and standards. To encourage consistency and uniformity, install luminaires of the same manufacture and model number when residing in the same facility or building.

### 3.1.1 Light Sources

When light sources are not provided as an integral part of the luminaire, deliver light sources of the type, wattage, lumen output, color temperature, color rendering index, and voltage rating indicated to the project site and install just prior to project completion, if not already installed in the luminaires from the factory.

### 3.1.2 Luminaires

Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent luminaires and secure in accordance with manufacturers' directions and approved drawings. Installation must meet requirements of applicable codes and standards. Mounting heights specified or indicated must be to the bottom of the luminaire for ceiling-mounted luminaires and to center of luminaire for wall-mounted luminaires. Obtain approval of the exact mounting height on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed luminaires must be independently supported from the building structure by a minimum of four wires, straps or rods per luminaire and located near each corner of the luminaire. Ceiling grid clips are not allowed as an alternative to independently supported luminaires. Round luminaires or luminaires smaller in size than the ceiling grid must be independently supported from the building structure by a minimum of four wires, straps or rods per luminaire, spaced approximately equidistant around. Do not support luminaires by acoustical tile ceiling panels. Where luminaires of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support each independently and provide at least two 19 mm metal channels spanning, and secured to, the ceiling tees for centering and aligning the luminaire. Provide wires, straps, or rods for luminaire support in this section.

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SECTION 27 10 00

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**08/11**

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# SECTION 27 10 00

# BUILDING TELECOMMUNICATIONS CABLING SYSTEM
**08/11**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Contractor may substitute compatible Japan Industrial Standard (JIS), Japan Architectural Standard Specification (JASS), or Japan Wire Industry Association Standard (JCS) standards for non-Japanese standards, as approved by the Contracting Officer's representative.

JAPAN WIRE INDUSTRY ASSOCIATION STANDARD (JCS)

| | |
|---|---|
| JCS 5507 | (2010) LAN Twisted Pair Cable |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS C 6820 | (2018) General rules of optical fibers |
| JIS C 6850 | (2006) General rules of optical fiber cables |
| JIS X 5150 | (R2016) Information Technology-Generic Cabling for Customer Premises |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 723 | (2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials |

### 1.2 RELATED REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, apply to this section with additions and modifications specified herein.

### 1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in JIS X 5150, JCS 5507, JIS C 6820, JIS C 6850, and herein.

#### 1.3.1 Campus Distributor (CD)

A distributor from which the campus backbone cabling emanates. (International expression for main cross-connect (MC).)

#### 1.3.2 Building Distributor (BD)

A distributor in which the building backbone cables terminate and at which connections to the campus backbone cables may be made. (International

expression for intermediate cross-connect (IC).)

1.3.3 Floor Distributor (FD)

A distributor used to connect horizontal cable and cabling subsystems or equipment. (International expression for horizontal cross-connect (HC).)

1.3.4 Telecommunications Room (TR)

An enclosed space for housing telecommunications equipment, cable, terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and the horizontal cabling.

1.3.5 Entrance Facility (EF) (Telecommunications)

An entrance to the building for both private and public network service cables (including wireless) including the entrance point at the building wall and continuing to the equipment room.

1.3.6 Equipment Room (ER) (Telecommunications)

An environmentally controlled centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

1.3.7 Open Cable

Cabling that is not run in a raceway as defined by applicable codes and standards. This refers to cabling that is "open" to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space.

1.3.8 Open Office

A floor space division provided by furniture, moveable partitions, or other means instead of by building walls.

1.3.9 Pathway

A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.4 SUBMITTALS
SD-02 Shop Drawings

Telecommunications drawings; G

1.5 QUALITY ASSURANCE

1.5.1 Shop Drawings

1.5.1.1 Telecommunications Drawings

Provide registered communications distribution designer (RCDD) approved, drawings in accordance with applicable codes and standards. The identifier for each termination and cable shall appear on the drawings. Drawings shall depict final telecommunications installed wiring system infrastructure. The drawings should provide details required to prove

that the distribution system shall properly support connectivity from the EF telecommunications and ER telecommunications, CD's and FD's to the telecommunications work area outlets.

### 1.5.2 Telecommunications Qualifications

Work under this section shall be performed by and the equipment shall be provided by the approved telecommunications contractor and key personnel. Qualifications shall be provided for: the telecommunications system contractor, the telecommunications system installer, and the supervisor (if different from the installer). A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.

#### 1.5.2.1 Telecommunications Contractor

The telecommunications contractor shall be a firm which is regularly and professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor shall demonstrate experience in providing successful telecommunications systems within the past 3 years of similar scope and size. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor.

#### 1.5.2.2 Key Personnel

Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. There may be one key person or more key persons proposed for this solicitation depending upon how many of the key roles each has successfully provided. Each of the key personnel shall demonstrate experience in providing successful telecommunications systems within the past 3 years.

Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel.

In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of 3 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for each of the key personnel. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this solicitation. Include specific experience in installing and testing telecommunications systems and provide the names and locations of at least two project installations successfully completed using telecommunications cabling systems. All of the existing telecommunications system installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this solicitation. Provide the name and role of the

key person, the title, location, and completed installation date of the referenced project, the referenced project owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

Indicate that all key persons are currently employed by the telecommunications contractor, or have a commitment to the telecommunications contractor to work on this project. All key persons shall be employed by the telecommunications contractor at the date of issuance of this solicitation, or if not, have a commitment to the telecommunications contractor to work on this project by the date that the bid was due to the Contracting Officer.

Note that only the key personnel approved by the Contracting Officer in the successful proposal shall do work on this solicitation's telecommunications system. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the telecommunications contractor's key personnel requires approval from the Contracting Officer.

### 1.5.3 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of applicable codes and standards unless more stringent requirements are specified or indicated.

### 1.5.4 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

#### 1.5.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

#### 1.5.4.2 Material and Equipment Manufacturing Date

Products manufactured more than 1 year prior to date of delivery to site shall not be used, unless specified otherwise.

## 1.6 DELIVERY AND STORAGE

Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.

## 1.7 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of0 to 60 degrees C and in the range of 0 to 95 percent relative humidity, noncondensing.

## 1.8 WARRANTY

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

# PART 2 PRODUCTS

## 2.1 COMPONENTS

Components shall be JIS, UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard. Provide a complete system of telecommunications cabling and pathway components using star topology. Provide support structures and pathways, complete with outlets, cables, connecting hardware and telecommunications cabinets/racks. Cabling and interconnecting hardware and components for telecommunications systems shall be listed or third party independent testing laboratory certified, and shall comply with applicable codes and standards and conform to the requirements specified herein.

## 2.2 TELECOMMUNICATIONS SPACES

### 2.2.1 Backboards

Provide void-free, interior grade A-C plywood 19 mm thick as indicated. Backboards shall be fire rated by manufacturing process. Fire stamp shall be clearly visible. Paint applied over fire retardant backboard shall be UL 723 fire retardant paint. Provide label including paint manufacturer, date painted, UL listing and name of Installer. When painted, paint label and fire stamp shall be clearly visible.

# PART 3 EXECUTION

## 3.1 INSTALLATION
## 3.2 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting

shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

### 3.2.1 Painting Backboards

If backboards are required to be painted, then the manufactured fire retardant backboard must be painted with fire retardant paint, so as not to increase flame spread and smoke density and must be appropriately labeled. Label and fire rating stamp must be unpainted.

-- End of Section --

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SECTION 28 31 76

INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE

**08/20**

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INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE
**08/20**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

| | |
|---|---|
| ASA S3.2 | (2020) American National Standard Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85) |

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

| | |
|---|---|
| ASME A17.1/CSA B44 | (2019) Safety Code for Elevators and Escalators |

FM GLOBAL (FM)

| | |
|---|---|
| FM APP GUIDE | (updated on-line) Approval Guide http://www.approvalguide.com/ |

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE C62.41.1 | (2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits |
| IEEE C62.41.2 | (2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 4 | (2018) Standard for Integrated Fire Protection and Life Safety System Testing |
| NFPA 70 | (2023) National Electrical Code |
| NFPA 72 | (2022; ERTA 22-1) National Fire Alarm and Signaling Code |
| NFPA 90A | (2021) Standard for the Installation of Air Conditioning and Ventilating Systems |
| NFPA 170 | (2021) Standard for Fire Safety and Emergency Symbols |

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| UFC 3-601-02 | (2021) Fire Protection Systems Inspection, Testing, and Maintenance |
| UFC 4-010-06 | (2016; with Change 1, 2017) Cybersecurity of Facility-Related Control Systems |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 47 CFR 15 | Radio Frequency Devices |
| 47 CFR 90 | Private Land Mobile Radio Services |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 268 | (2016; Reprint Nov 2021) UL Standard for Safety Smoke Detectors for Fire Alarm Systems |
| UL 268A | (2008; Reprint Oct 2014) Smoke Detectors for Duct Application |
| UL 464 | (2016; Reprint Sep 2017) UL Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories |
| UL 497A | (2001; Bul. 2019) UL Standard for Safety Secondary Protectors for Communications Circuits |
| UL 497B | (2004; Reprint Feb 2022) UL Standard for Safety Protectors for Data Communications and Fire Alarm Circuits |
| UL 864 | (2014; Reprint May 2020) UL Standard for Safety Control Units and Accessories for Fire Alarm Systems |
| UL 1283 | (2017) UL Standard for Safety Electromagnetic Interference Filters |
| UL 1449 | (2021; Reprint Dec 2022) UL Standard for Safety Surge Protective Devices |
| UL 1480 | (2016; Reprint Sep 2017) UL Standard for Safety Speakers for Fire Alarm and Signaling Systems, Including Accessories |
| UL 1638 | (2016; Reprint Sep 2017) UL Standard for Safety Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories |
| UL 1971 | (2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired |
| UL 2017 | (2008; Reprint Dec 2018) UL Standard for |

| | |
|---|---|
| | Safety General-Purpose Signaling Devices and Systems |
| UL 2572 | (2016; Bul. 2018) UL Standard for Safety Mass Notification Systems |
| UL Fire Prot Dir | (2020) Fire Protection Equipment Directory |

## 1.2 RELATED SECTIONS

Section 25 05 11 Cybersecurity for Facility-Related Control Systems, applies to this section, with the additions and modifications specified herein. In addition, refer to the following sections for related work and coordination:

Section 21 13 13 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

## 1.3 SUMMARY

### 1.3.1 Scope

a. This work includes designing and modifying the existing fire alarm and mass notification (MNS) system as described herein and on the contract drawings. Include system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, initiating devices, notification appliances, supervising station fire alarm transmitters/mass notification transceiver, and other accessories and miscellaneous items required for a complete operational system even though each item is not specifically mentioned or described. Provide systems complete and ready for operation. Existing interior fire alarm system was manufactured by Honeywell (Gamewell FCI E3 Series). Design and installation must comply with UFGS 25 05 11, UFC 4-010-06 and AFGM 2019-320-02.

b. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with NFPA 72, except as modified herein. The system layout on the drawings show the intent of coverage and suggested locations. Final quantity, system layout, and coordination are the responsibility of the Contractor.

f. The fire alarm and mass notification system must be independent of the building security, building management, and energy/utility monitoring systems other than for control functions.

### 1.3.2 Qualified Fire Protection Engineer (QFPE)

Services of the QFPE must include:

a. Reviewing SD-02, SD-03, and SD-05 submittal packages for completeness and compliance with the provisions of this specification. Construction (shop) drawings and calculations must be prepared by, or prepared under the immediate supervision of, the QFPE. The QFPE must affix their professional engineering stamp with signature to the shop drawings, calculations, and material data sheets, indicating approval prior to submitting the shop drawings to the DFPE.

b. Providing a letter documenting that the SD-02, SD-03, and SD-05 submittal package has been reviewed and noting any outstanding comments.

c. Performing in-progress construction surveillance prior to installation of ceilings (rough-in inspection).

d. Witnessing pre-Government and final Government functional performance testing and performing a final installation review.

e. Signing applicable certificates under SD-07.

## 1.4 DEFINITIONS

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions must be defined as follows:

### 1.4.1 Interface Device

An addressable device that interconnects hard wired systems or devices to an analog/addressable system.

### 1.4.2 Fire Alarm and Mass Notification Control Unit (FMCU)

A master control unit having the features of a fire alarm control unit (FACU) and an autonomous control unit (ACU) where these units are interconnected to function as a combined fire alarm/mass notification system. The FACU and ACU functions may be contained in a single cabinet or in independent, interconnected, and co-located cabinets.

### 1.4.3 Remote Fire Alarm and Mass Notification Control Unit

A control unit, physically remote from the fire alarm and mass notification control unit, that receives inputs from automatic and manual fire alarm devices; may supply power to detection devices and interface devices; may provide transfer of power to the notification appliances; may provide transfer of condition to relays or devices connected to the control unit; and reports to and receives signals from the fire alarm and mass notification control unit.

### 1.4.4 Local Operating Console (LOC)

A unit designed to allow emergency responders and/or building occupants to operate the MNS including delivery of recorded messages and/or live voice announcements, initiate visual, textual visual, and audible appliance operation and other relayed functions.

### 1.4.5 Terminal Cabinet

A steel cabinet with locking, hinge-mounted door where terminal strips are securely mounted inside the cabinet.

### 1.4.6 Control Module and Relay Module

Terms utilized to describe emergency control function interface devices as defined by NFPA 72.

### 1.4.7 Designated Fire Protection Engineer (DFPE)

The DoD fire protection engineer that oversees that Area of Responsibility for that project. This is sometimes referred to as the "cognizant" fire protection engineer. Interpret reference to "authority having

jurisdiction" and/or AHJ in referenced standards to mean the Designated Fire Protection Engineer (DFPE). The DFPE may be responsible for review of the contractor submittals having a "G" designation, and for witnessing final inspection and testing.

### 1.4.8 Qualified Fire Protection Engineer (QFPE)

A QFPE is an individual who is a licensed professional engineer (P.E.), who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveying (NCEES) and has relevant fire protection engineering experience.

## 1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval.

Shop drawings (SD-02), product data (SD-03) and calculations (SD-05) must be prepared by, or prepared under the immediate supervision of, the QFPE and combined and submitted as one complete package. The QFPE must affix their professional engineering stamp with signature to the shop drawings, calculations and material data sheets, indicating approval prior to submitting the fire alarm system shop drawings to the DFPE. the installation of the fire alarm system and certify in writing that the fire alarm system has been constructed and operates as intended in the design plans and specifications Partial submittals and submittals not reviewed by the QFPE will be returned by the Government disapproved without review.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualified Fire Protection Engineer (QFPE); G

Fire alarm system designer; G

Supervisor; G

Technician; G

Installer; G

Test Technician; G

Fire Alarm System Site-Specific Software Acknowledgement; G

SD-02 Shop Drawings

Nameplates; G

Instructions; G

Wiring Diagrams; G

System Layout; G

Notification Appliances; G

Initiating devices; G

Amplifiers; G

Battery Power; G

Voltage Drop Calculations; G

SD-03 Product Data

Fire Alarm and Mass Notification Control Unit (FMCU); G

Local Operating Console (LOC); G

Amplifiers; G

Tone Generators; G

Digitalized voice generators; G

Smoke Detectors; G

Duct Smoke Detectors; G

Addressable Interface Devices; G

Notification Appliances; G

Textual Display Sign Control Panel; G

Textual Display Signs; G

Batteries; G

Battery Chargers; G

Supplemental Notification Appliance Circuit Panels; G

Auxiliary Power Supply Panels; G

Surge Protective Devices; G

Alarm Wiring; G

Back Boxes and Conduit; G

Ceiling Bridges for Ceiling-Mounted Appliances; G

Terminal Cabinets; G

Firefighter Telephone; G

Document Storage Cabinet; G

Mass Notification Transceiver; G

Addressable Control Modules; G

Automatic Fire Alarm Transmitters; G

Radio Transmitter And Interface Panels; G

Environmental Enclosures Or Guards; G

SD-06 Test Reports

Test Procedures; G

SD-07 Certificates

Verification of Compliant Installation; G

Request for Government Final Test; G

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions; G

Instruction of Government Employees; G

SD-11 Closeout Submittals

As-Built Drawings

Spare Parts

## 1.6 SYSTEM OPERATION

Fire alarm system/mass notification system including textual display sign control panel(s), components requiring power, except for the FMCU(s) power supply, must operate on 24 volts DC unless noted otherwise in this section.

The interior fire alarm and mass notification system must be a complete, supervised, noncoded, analog/addressable fire alarm and mass notification system conforming to NFPA 72, UL 864, and UL 2572. Systems meeting UL 2017 only are not acceptable. The system must be activated into the alarm mode by actuation of an alarm initiating device. The system must remain in the alarm mode until the initiating device is reset and the control unit is reset and restored to normal. The system may be placed in the alarm mode by local microphones, LOC, FMCU, or remotely from authorized locations/users.

### 1.6.1 Alarm Initiating Devices and Notification Appliances (Visual, Voice, Textual)

a. Connect alarm initiating devices to initiating device circuits (IDC) Class "B", or to signaling line circuits (SLC) Class "B" and installed in accordance with NFPA 72.

b. Connect notification appliances to notification appliance circuits (NAC) Class "B".

### 1.6.2 Functions and Operating Features

The system must provide the following functions and operating features:

a. Power, annunciation, supervision, and control for the system. Addressable systems must be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.

b. Visual alarm notification appliances must be synchronized as required by NFPA 72.

c. Electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control unit.

d. An audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal must also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory control unit modules. After the system returns to normal operating conditions, the trouble signal must again sound until the trouble is acknowledged. A smoke detector in the process of being verified for the actual presence of smoke must not initiate a trouble condition.

e. A trouble signal silence feature that must silence the audible trouble signal, without affecting the visual indicator.

f. Program capability via switches in a locked portion of the FMCU to bypass the automatic notification appliance circuits, features. Operation of this programmed action must indicate on the FMCU display as a supervisory or trouble condition.

g. Alarm functions must override trouble or supervisory functions. Supervisory functions must override trouble functions.

h. The system must be capable of being programmed from the control unit keyboard. Programmed information must be stored in non-volatile memory.

i. The system must be capable of operating, supervising, and/or monitoring non-addressable alarm and supervisory devices.

j. There must be no limit, other than maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.

k. Where the fire alarm/mass notification system is responsible for initiating an action in another emergency control device or system, such as HVAC, elevator recall, the addressable fire alarm relay must be located in the vicinity of the emergency control device.

l. An alarm signal must automatically initiate the following functions:

(1) Transmission of an alarm signal to the fire department.

(2) Visual indication of the device operated on the FMCU, .

(4) Actuation of alarm notification appliances.

(5) Recording of the event electronically in the history log of the FMCU.

(7) Operation of the smoke control system.

(8) Release of power to electric locks (delayed egress locks) on doors that are part of the means of egress.

(9) Elevator recall as described in this section.

(11) Operation of a sprinkler waterflow switch serving an elevator machinery room or elevator shaft must operate shunt trip circuit breaker(s) to shut down power to the elevators in accordance with ASME A17.1/CSA B44.

m. A supervisory signal must automatically initiate the following functions:

(1) Visual indication of the device operated on the FMCU, .

(3) Transmission of a supervisory signal to the fire department.

(4) Operation of a duct smoke detector must shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph and as allowed by NFPA 72.

(5) Recording of the event electronically in the history log of the FMCU.

n. A trouble condition must automatically initiate the following functions:

(1) Visual indication of the device operated on the FMCU, .

(3) Transmission of a trouble signal to the fire department.

(4) Recording of the event electronically in the history log of the FMCU.

p. System control equipment must be programmed to provide a 60-minute to 180-minute delay in transmission of trouble signals resulting from primary power failure.

### 1.6.3 Elevator Recall

Provide elevator recall in accordance with ASME A17.1/CSA B44, Section , and as specified herein. Activation of any smoke detector in an elevator shaft, machine room, or lobby (except at designated recall level) must cause all elevators associated with that shaft, machine room, or lobby to return nonstop to the designated level. Activation of a smoke detector in the lobby or machine room at the designated level must cause all elevators associated with that lobby to return nonstop to the assigned alternate level. Activation of a detector in an elevator shaft, machine room, or lobby must also cause illumination of elevator cab warning signal (fire hat) and complete operation of fire alarm system as specified in paragraph titled "Functions and Operating Features".

## 1.7 TECHNICAL DATA AND SITE-SPECIFIC SOFTWARE

Technical data and site-specific software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be required in other specifications, must be delivered, strictly in accordance with the CONTRACT CLAUSES. The fire alarm system

manufacturer must submit written confirmation of this contract provision as "Fire Alarm System Site-Specific Software Acknowledgement". Identify data delivered by reference to the specification paragraph against which it is furnished. Data to be submitted must include complete system, equipment, and software descriptions. Descriptions must show how the equipment will operate as a system to meet the performance requirements of this contract. The site-specific software data package must also include the following:

a. Items identified in NFPA 72, titled "Site-Specific Software".

b. Identification of programmable portions of the system equipment and capabilities.

c. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.

d. Provision of operational software data on all modes of programmable portions for fire alarm and mass notification.

e. Description of Fire Alarm and Mass Notification Control Unit equipment operation.

f. Description of auxiliary and remote equipment operations.

g. Library of application software.

h. Operation and maintenance manuals.

## 1.8 EXISTING EQUIPMENT

a. Equipment and devices must be compatible and operable with the existing fire alarm/mass notification system and must not impair reliability or operational functions of existing supervising station fire alarm system. The proprietary type supervising station (PSS) is located at the fire department. The supervising equipment is existing and consists of the following brands and models: supervising station control unit Monaco D21.

b. Equipment and devices must be compatible and operable with the existing building fire alarm/mass notification system. Equipment must not impair reliability or operational functions of the existing system. The existing building system control unit is Gamewell FCI S3 Series by Honeywell.

c. Equipment and devices must be compatible and operable with the existing installation-wide mass notification system and must not impair reliability or operational functions of the existing system. The installation-wide mass notification system utilizes Monaco transceivers.

## 1.9 QUALITY ASSURANCE

### 1.9.1 Submittal Documents

#### 1.9.1.1 Preconstruction Submittals

Within 36 days of contract award but not less than 14 days prior to commencing any work on site, the Contractor must submit the following for

review and approval. SD-02, SD-03 and SD-05 submittals received prior to the review and approval of the qualifications of the fire alarm subcontractor and QFPE must be returned disapproved without review. All resultant delays must be the sole responsibility of the Contractor.

1.9.1.2 Shop Drawings

Shop drawings must not be smaller than the Contract Drawings. Drawings must comply with the requirements of NFPA 72 and NFPA 170. Minimum scale for floor plans must be 1/8"=1'.

1.9.1.3 Nameplates

Nameplate illustrations and data to obtain approval by the Contracting Officer before installation.

1.9.1.4 Wiring Diagrams

3 copies of point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the FMCU and remote FMCU, initiating circuits, switches, relays and terminals, including pathway diagrams between the control unit and shared communications equipment within the protected premises. Point-to-point wiring diagrams must be job specific and must not indicate connections or circuits not being utilized. Provide complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment. Include a color-code schedule for the wiring.

1.9.1.5 System Layout

3 copies of plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, conduit sizes, wire counts, conduit fill calculations, wire color-coding, circuit identification in each conduit, and circuit layouts for all floors. Indicate candela rating of each visual notification appliance. Indicate the wattage of each speaker. Clearly identify the locations of isolation modules. Indicate the addresses of all devices, modules, relays, and similar. Show/identify all acoustically similar spaces. Indicate if the environment for the FMCU is within its environmental listing (e.g. temperature/humidity).

Provide a complete description of the system operation in matrix format similar to the "Typical Input/Output Matrix" included in the Annex of NFPA 72.

1.9.1.6 Notification Appliances

Calculations and supporting data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances. Annotate data for each circuit on the drawings.

1.9.1.7 Initiating Devices

Calculations and supporting data on each circuit to indicate that there is at least 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

1.9.1.8 Amplifiers

Calculations and supporting data to indicate that amplifiers have sufficient capacity to simultaneously drive all notification speakers at tapped settings plus 25 percent spare capacity. Annotate data for each circuit on the drawings.

1.9.1.9 Battery Power

Calculations and supporting data as required in paragraph Battery Power Calculations for alarm, alert, and supervisory power requirements. Calculations including ampere-hour requirements for each system component and each control unit component, and the battery recharging period, must be included on the drawings.

1.9.1.10 Voltage Drop Calculations

Voltage drop calculations for each notification circuit indicating that sufficient voltage is available for proper operation of the system and all components, at a minimum rated voltage of the system operating on batteries. Include the calculations on the system layout drawings.

1.9.1.11 Product Data

3 copies of annotated descriptive data to show the specific model, type, and size of each item. Catalog cuts must also indicate the NRTL listing. The data must be highlighted to show model, size, and options that are intended for consideration. Data must be adequate to demonstrate compliance with all contract requirements. Product data for all equipment must be combined into a single submittal.

Provide an equipment list identifying the type, quantity, make, and model number of each piece of equipment to be provided under this submittal. The equipment list must include the type, quantity, make and model of spare equipment. Types and quantities of equipment submitted must coincide with the types and quantities of equipment used in the battery calculations and those shown on the shop drawings.

1.9.1.12 Operation and Maintenance (O&M) Instructions

Six copies of the Operation and Maintenance Instructions. The O&M Instructions must be prepared in a single volume or in multiple volumes, with each volume indexed, and may be submitted as a Technical Data Package. Manuals must be approved prior to training. The Interior Fire Alarm And Mass Notification System Operation and Maintenance Instructions must include the following:

a. "Manufacturer Data Package five" as specified in .

b. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual must include the manufacturer's name, model number, service manual, parts list, and preliminary equipment list complete with description of equipment and their basic operating features.

c. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals must include conduit layout, equipment layout and simplified wiring, and

control diagrams of the system as installed.

d. Complete procedures for system revision and expansion, detailing both equipment and software requirements.

e. Software submitted for this project on CD/DVD media utilized.

f. Printouts of configuration settings for all devices.

g. Routine maintenance checklist. The routine maintenance checklist must be arranged in a columnar format. The first column must list all installed devices, the second column must state the maintenance activity or state no maintenance required, the third column must state the frequency of the maintenance activity, and the fourth column provided for additional comments or reference. All data (devices, testing frequencies, and similar) must comply with UFC 3-601-02.

h. A final Equipment List must be submitted with the Operating and Maintenance (O&M) manual.

1.9.1.13 As-Built Drawings

The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final Government test of the system. At least one set of the as-built (marked-up) drawings must be provided at the time of, or prior to the final Government test.

1.9.2 Qualifications

1.9.2.1 Fire Alarm System Designer

The fire alarm system designer must be certified as a Level III (minimum) Technician by National Institute for Certification in Engineering Technologies (NICET) in the Fire Alarm Systems subfield of Fire Protection Engineering Technology or meet the qualifications for a QFPE.

1.9.2.2 Supervisor

A NICET Level III or IV fire alarm technician must supervise the installation of the fire alarm/mass notification system.A fire alarm technician with a minimum of eight years of experience must supervise the installation of the fire alarm/mass notification system. The fire alarm technicians supervising the installation of equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.9.2.3 Technician

Fire alarm technicians with a minimum of four years of experience must be utilized to install and terminate fire alarm/mass notification devices, cabinets and control units. The fire alarm technicians installing the equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.9.2.4 Installer

Fire alarm installer with a minimum of two years of experience utilized to

assist in the installation of fire alarm/mass notification devices, cabinets and control units. A licensed electrician must be allowed to install wire, cable, conduit and backboxes for the fire alarm system/mass notification system. The fire alarm installer must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.9.2.5 Test Technician

Fire alarm technicians with a minimum of eight years of experience and NICET Level III or IV utilized in testing and certification of the installation of the fire alarm/mass notification devices, cabinets and control units. The fire alarm technicians testing the equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment installed as part of this project.

1.9.2.6 Manufacturer

Components must be of current design and must be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as specified herein.

1.9.3 Regulatory Requirements

Equipment and material must be listed or approved. Listed or approved, as used in this section, means listed, labeled or approved by a Nationally Recognized Testing Laboratory (NRTL) such as UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of any item of equipment described must not be construed as waiving this requirement. All listings or approvals by testing laboratories must be from an existing ANSI or UL published standard. The recommended practices stated in the manufacturer's literature or documentation must be considered as mandatory requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

1.11 MAINTENANCE

1.11.1 Spare Parts

Furnish the following spare parts in the manufacturers original unopened containers:

a. Five complete sets of system keys.

b. Two of each type of fuse required by the system.

d. Two of each type of detector installed.

e. Two of each type of detector base and head installed.

i. Two of each type of audible and visual alarm device installed.

j. One textual visual notification appliance.

k. Two of each type of addressable monitor module installed.

l. Two of each type of addressable control module installed.

m. Two low voltage, , and one 120 VAC surge protective device.

1.11.2 Special Tools

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment must be furnished to the Contracting Officer, prior to the instruction of Government employees.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENT

All fire alarm and mass notification equipment must be listed for use under the applicable reference standards. Interfacing of UL 864 or similar approved industry listing with Mass Notification equipment listed to UL 2572 must be done in a laboratory listed configuration, if the software programming features cannot provide a listed interface control.

2.2 MATERIALS AND EQUIPMENT

2.2.1 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory and listed for fire protection service when so required by NFPA 72 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment must be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid opening.

2.2.2 Nameplates

Major components of equipment must have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new name plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

a. FMCU

Nameplates must be etched metal or plastic, permanently attached by screws to control units or adjacent walls.

2.2.3 Keys

Keys and locks for equipment, control units and devices must be identical. Master all keys and locks to a single key as required by the Installation Fire Department.

2.2.4 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a

Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the instructions on the interior of the FMCU. The card must show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions must also include procedures for operating live voice microphones. The instructions and their mounting location must be approved by the Contracting Officer before being posted.

## 2.3 LOCAL OPERATING CONSOLES (LOC)

### 2.3.1 General

The LOC must consist of a remote microphone station incorporating a push-to-talk (PTT) hand-held microphone and system status indicators. The LOC must have the capability of being utilized to activate prerecorded messages. The unit must incorporate microphone override of any tone generation or recorded messages. The unit must be fully supervised from the FMCU. The housing for the LOC must not be lockable.

### 2.3.2 Multiple LOCs

When an installation has more than one LOC, the LOCs must be programmed to allow only one LOC to be available for paging or messaging at a time. Once one LOC becomes active, all other LOC's will have an indication that the system is busy (Amber Busy Light) and cannot be used at that time. This is to avoid two messages being given at the same time. It must be possible to override or lockout the LOC's from the FMCU.

## 2.4 AMPLIFIERS, PREAMPLIFIERS, TONE GENERATORS

Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 must be housed in a remote FMCU, terminal cabinet, or in the FMCU. Individual amplifiers must be 100 watts maximum.

### 2.4.1 Operation

The system must automatically operate and control all building speakers.

### 2.4.2 Construction

Amplifiers must utilize computer grade solid state components and must be provided with output protection devices sufficient to protect the amplifier against any transient up to 10 times the highest rated voltage in the system.

### 2.4.3 Inputs

Equip each system with separate inputs for the tone generator, digitalized voice driver and control unit mounted microphone . Microphone inputs must be of the low impedance, balanced line type. Both microphone and tone generator input must be operational on any amplifier.

### 2.4.4 Tone Generator

The tone generator must produce a three-pulse temporal pattern and must be constantly repeated until interrupted by either the digitalized voice

message, the microphone input, or the alarm silence mode as specified. The tone generator must be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay. The tone generator must be provided with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces.

### 2.4.5 Protection Circuits

Each amplifier must be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component must cause illumination of a visual "amplifier trouble" indicator on the control unit, appropriate logging of the condition in the history log, and other actions for trouble conditions as specified.

## 2.5 SMOKE DETECTORS

### 2.5.1 Spot Type Detectors

Provide addressable photoelectric smoke detectors as follows:

a. Provide analog/addressable photoelectric smoke detectors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke detectors must be be replaced with the same manufactuer smoke detector and the exact model or manufactuer replacement model andlisted for use with the existingFMCU.

b. Provide self-restoring type detectors that do not require any readjustment after actuation at the FMCU to restore them to normal operation. The detector must have a visual indicator to show actuation.

c. Vibration must have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen must not inhibit the movement of smoke particles into the chamber.

d. Provide twist lock bases with sounder that produces a minimum of 90 dBA at 3 m with screw terminals for each conductor. The detectors must maintain contact with their bases without the use of springs.

e. The detector address must identify the particular unit, its location within the system, and its sensitivity setting. Detectors must be of the low voltage type rated for use on a 24 VDC system.

f.All replaced smoke detectors shall be turned over to 18 CES/CEOFA

### 2.5.2 Duct Smoke Detectors

Duct-mounted addressable photoelectric smoke detectors must consist of a smoke detector, as specified in paragraph Spot Type Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry must be mounted in a metallic or plastic enclosure exterior to the duct. Detectors must be listed for operation over the complete range of air velocities, temperature and humidity expected at the detector when the air-handling system is operating. Detectors must be powered from the FMCU.

a. Sampling tubes must run the full width of the duct. The duct detector package must conform to the requirements of NFPA 90A, UL 268A, and must be listed for use in air-handling systems. The control functions, operation, reset, and bypass must be controlled from the FMCU.

b. Lights to indicate the operation and alarm condition must be visible and accessible with the unit installed and the cover in place. Remote indicators must be provided where required by NFPA 72. Remote indicators as well as the affected fan units must be properly identified in etched plastic placards.

c. Detectors must provide for control of auxiliary contacts that provide control, interlock, and shutdown functions. Auxiliary contacts provide for this function must be located within 1 m of the controlled circuit or appliance. The auxiliary contacts must be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

## 2.6 ADDRESSABLE INTERFACE DEVICES

The initiating device being monitored must be configured as a Class "B" initiating device circuits. The module must be listed as compatible with the control unit. The module must provide address setting means compatible with the control unit's SLC supervision and store an internal identifying code. Monitor module must contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Pull stations with a monitor module in a common backbox are not required to have an LED. Existing fire alarm system initiating device circuits must be connected to a single module to supervise the circuit. Modules must be listed for the environmental conditions in which they will be installed.

## 2.7 ADDRESSABLE CONTROL MODULES

The control module must be capable of operating as a relay (dry contact form C) for interfacing the control unit with other systems, and to control door holders or initiate elevator fire service. The module must be listed as compatible with the control unit. The indicating device or the external load being controlled must be configured as Class B notification appliance circuits. The system must be capable of supervising, audible, visual and dry contact circuits. The control module must have both an input and output address. The supervision must detect a short on the supervised circuit and must prevent power from being applied to the circuit. The control module must provide address setting means compatible with the control unit's SLC supervision and store an internal identifying code. The control module must contain an integral LED that flashes each time the control module is polled and is visible through the device cover plate. Control Modules must be listed for the environmental conditions in which they will be installed.

## 2.8 NOTIFICATION APPLIANCES

### 2.8.1 Audible Notification Appliances

Audible appliances must conform to the applicable requirements of UL 464. Appliances must be connected into notification appliance circuits. Surface mounted audible appliances must be painted white. Recessed audible appliances must be installed with a grill that is painted white.

#### 2.8.1.1 Speakers

a. Speakers must conform to the applicable requirements of UL 1480. Speakers must have six different sound output levels and operate with audio line input levels of 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Interior speaker tap settings must include taps of 1/4, 1/2, 1, and 2 watt, at a minimum. Exterior speakers must also be multi-tapped with no more than 15 watt maximum setting. Speakers must incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400 Hz to 4,000 Hz, and must have a sealed back construction. Speakers must be capable of installation on standard 100 mm square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single wall mounted unit. All inputs must be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FMCU.

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 1.519 mm or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes must be ground and finished to provide a smooth and neat appearance for each plate. Each plate must be primed and painted.

c. Speakers must utilize screw terminals for termination of all field wiring.

### 2.8.2 Visual Notification Appliances

Visual notification appliances must conform to the applicable requirements of UL 1638, UL 1971 and conform to the Architectural Barriers Act (ABA). Visual Notification Appliances must have clear high intensity optic lens, xenon flash tubes, or light emitting diode (LED) and be marked "Alert" in letters of contrasting color. The light pattern must be dispersed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate must be 1 flash per second and a minimum of 15 candela based on the UL 1971 test. Strobe must be surface mounted.

### 2.8.3 Textual Display Signs

Textual display signs must be LED and must not exceed 400 mm long by 150 mm high by 75 mm deep with a height necessary to meet the requirements of NFPA 72. The text display must spell out the word "EVACUATE" or "ANNOUNCEMENT" as appropriate. The design of text display must be such that it cannot be read when not illuminated.

LCD or LED scrolling text displays must meet the following requirements at a minimum:

a. Two lines of information for high priority messaging.

b. Minimum of 20 characters per line (40 total) displayed.

c. Text must be no less than height requirements and color/contrast requirements of NFPA 72.

d. 32K character memory.

e. Display must be wall or ceiling mounted.

f. Mounting brackets for a convenient wall/cubicle mount.

g. During non-emergency periods, display date and time.

h. The system must interface with the textual display sign control panel to activate the proper message.

## 2.9 ELECTRIC POWER

### 2.9.1 Primary Power

Power must be 120 VAC 50 Hz service for the FMCU from the AC service to the building in accordance with NFPA 72.

## 2.10 SECONDARY POWER SUPPLY

Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power must be automatic and must not cause transmission of a false alarm.

### 2.10.1 Batteries

Provide sealed, maintenance-free, sealed lead acid batteries as the source for emergency power to the FMCU. Batteries must contain suspended electrolyte. The battery system must be maintained in a fully charged condition by means of a solid state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power. All secondary power supply batteries in all fire alarm and mass notification panels shall be replaced with new.

#### 2.10.1.1 Capacity

Battery size must be the greater of the following two capacities. This capacity applies to every control unit associated with this system, including supplemental notification appliance circuit panels, auxiliary power supply panels, fire alarm transmitters, and Base-wide mass notification transceivers. When determining the required capacity under alarm condition, visual notification appliances must include both textual and non-textual type appliances.

a. Sufficient capacity to operate the fire alarm system under supervisory and trouble conditions, including audible trouble signal devices for 48 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.

b. Sufficient capacity to operate the mass notification for 60 minutes after loss of AC power.

#### 2.10.1.2 Battery Power Calculations

a. Verify that battery capacity exceeds supervisory and alarm power requirements for the criteria noted in the paragraph "Capacity" above.

(1) Substantiate the battery calculations for alarm and supervisory power requirements. Include ampere-hour requirements for each system component and each control unit component, and compliance

with UL 864.

(2) Provide complete battery calculations for both the alarm and supervisory power requirements. Submit ampere-hour requirements for each system component with the calculations.

(3) Provide voltage drop calculations to indicate that sufficient voltage is available for proper operation of the system and all components. Calculations must be performed using the minimum rated voltage of each component.

b. For battery calculations assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required Amp-Hours for the specified standby time, and then calculate the required Amp-Hours for the specified alarm time. Using 20.4 VDC as starting voltage, perform a voltage drop calculation for circuits containing device and/or appliances remote from the power sources.

2.10.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger must be capable of providing 120 percent of the connected system load and must maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts dc), the charger must recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph CAPACITY above. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

2.11 SURGE PROTECTIVE DEVICES

Surge protective devices must be provided to suppress all voltage transients which might damage fire alarm control unit components. Systems having circuits located outdoors, communications equipment must be protected against surges induced on any signaling line circuit. Cables and conductors, that serve as communications links, must have surge protection circuits installed at each end. The surge protective device must wire in series to the power supply of the protected equipment with screw terminations. Line voltage surge arrestor must be installed directly adjacent to the power panel where the FMCU breaker is located.

a. Surge protective devices for nominal 120 VAC must be UL 1449 listed with a maximum 500 volt suppression level and have a maximum response time of 5 nanoseconds. The surge protective device must also meet IEEE C62.41.1 and IEEE C62.41.2 category B tests for surge capacity. The surge protective device must feature multi-stage construction and be provided with a long-life indicator lamp (either light emitting diode or neon) which extinguishes upon failure of protected components. Any unit fusing must be externally accessible.

b. Surge protective devices for nominal 24 VAC, fire alarm telephone dialer, or ethernet connection must be UL 497B listed, meet IEEE C62.41.1 and have a maximum response time of 1-nanosecond. The surge protective device must feature multi-stage construction and be self-resetting. The surge protective device must be a base and plug style. The base assembly must have screw terminals for fire alarm wiring. The base assembly must accept "plug-in" surge protective module.

c. All surge protective devices (SPD) must be the standard product of a single manufacturer and be equal or better than the following:

(1) For 120 VAC nominal line voltage: UL 1449 and UL 1283 listed, series connected 120 VAC, 20A rated, surge protective device in a NEMA 4x enclosure. Minimum 50,000 amp surge current rating with EMI/RFI filtering and a dry contact circuit for remote monitoring of surge protection status.

(2) For 24-volt nominal line voltage: UL 497B listed, series connected low voltage, 24-volt, 5A rated, loop circuit protector, base and replaceable module.

(3) For alarm telephone dialers: UL 497A listed, series connected, 130-volt, 150 mA rated with self-resetting fuse, dialer circuit protector with modular plug and play.

(4) For IP-DACTS: UL 497B listed, series connected, 6.4-volt, 1.5A rated with 20 kA/pair surge current, data network protector with modular plug and play.

## 2.12 WIRING

Provide wiring materials under this section as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein.

### 2.12.1 Alarm Wiring

IDC and SLC wiring must be solid copper cable in accordance with the manufacturers requirements. Copper signaling line circuits must be No. 18 AWG and initiating device circuit field wiring must be No. 16 AWG size conductors at a minimum. Visual notification appliance circuit conductors, that contain audible alarm appliances, must be copper No. 16 AWG size conductors at a minimum. Speaker circuits must be copper No. 16 AWG size twisted and shielded conductors at a minimum. Wiring for textual notification appliance circuits must be in accordance with manufacturer's requirements but must be supervised by the FMCU. Wire size must be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC must not operate at less than the listed voltages for the detectors and/or appliances. Power wiring, operating at 120 VAC minimum, must be a minimum No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR or FPLP as appropriate with red colored covering. Nonpower-limited cables must comply with NFPA 70.

## 2.13 INTERFACE TO THE BASE-WIDE MASS NOTIFICATION NETWORK

### 2.13.1 Radio

The mass notification transceiver must be bi-direction and meet all the requirements of paragraph, RADIO TRANSMITTER AND INTERFACE PANELS as specified in this specification section. The transceiver utilized in the mass notification system must be capable of the following:

a. Communication with the central control/monitoring system to provide supervision of communication link and status changes are reported by automatic and manual poll/reply/acknowledge routines.

b. All monitored points/status changes are transmitted immediately and at programmed intervals until acknowledged by the central control/monitoring system.

c. Each transceiver must transmits a unique identity code as part of all messages; the code is set by the user at the transceiver.

## 2.14 AUTOMATIC FIRE ALARM TRANSMITTERS

### 2.14.1 Radio Transmitter and Interface Panels

Transmitters must be compatible with proprietary supervising station receiving equipment. Each radio alarm transmitter must be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Transmitters must be provided in accordance with applicable portions of NFPA 72, Federal Communications Commission (FCC) 47 CFR 90 and Federal Communications Commission (FCC) 47 CFR 15. Transmitter electronics module must be contained within the physical housing as an integral, removable assembly. The proprietary supervising station receiving equipment is Monaco D21 and the transmitter must be fully compatible with this equipment. At the contractors option, and if listed, the transmitter may be housed in the same control unit as the FMCU. The transmitter must be narrowband radio, with FCC certification for narrowband operation and meets the requirements of the NTIA (National Telecommunications and Information Administration) Manual of Regulations and Procedures for Federal Frequency Management.

#### 2.14.1.1 Operation

Operate each transmitter from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter must automatically switch to battery operation. Switchover must be accomplished with no interruption of protective service, and must automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply must also be automatic.

#### 2.14.1.2 Battery Power

Transmitter standby battery capacity must provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.

### 2.14.2 Signals to Be Transmitted to the Base Receiving Station

The following signals must be sent to the base receiving station:

a. Sprinkler waterflow

b. Manual pull stations

c. Smoke detectors

d. Duct smoke detectors

e. Sleeping room smoke detectors

f. Sprinkler valve supervision

## 2.15 SYSTEM MONITORING

### 2.15.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, isolating valves for pressure type waterflow or supervision switches, and valves at backflow preventers, whether supplied under this contract or existing, must be electrically monitored to ensure its proper position. Provide each tamper switch with a separate address, unless they are within the same room, then a maximum of five can use the same address.

## 2.16 ENVIRONMENTAL ENCLOSURES OR GUARDS

Environmental enclosures must be provided to permit fire alarm/mass notification components to be used in areas that exceed the environmental limits of the listing. The enclosure must be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the component is currently listed. Guards required to deter mechanical damage must be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

## 2.17 FIREFIGHTER TELEPHONE COMMUNICATION SYSTEM

### 2.17.1 General

Provide a firefighter telephone communication system with complete, common talk, closed circuits. The system must include, but not be limited to, a master control station mounted in the fire alarm control unit, a power supply and standby battery system, and remote telephone stations.

### 2.17.2 Features

The system must include the following features:

a. A master control station which must provide power, supervision, and control for wiring, components, and circuits. The act of lifting any remote telephone hand set from its cradle must cause both a visual and audible signal to annunciate at the master control station. Removing the hand set at the master control station and depressing a button at the remote telephone hand set must cause the automatic silencing of the audible signal.

b. Communication between the master control station hand set and any/or all remote hand sets must require the depressing of a push-to-talk switch located on any/all remote hand sets. During the time that the master control hand set is removed from its cradle it must be possible to communicate between five remote hand sets and the master control station.

c. Hand sets must be able to monitor any conversation in progress and join the conversation by pressing the push-to-talk button. It must not be possible to communicate between two or more remote hand sets with the master control station hand set in its cradle.

d. The master control station hand set must be red in color and equipped with a 1.5 m long strain-relieved coiled cord.

e. The master control station must monitor wire and connections for any opens, shorts, or grounds which would render the system inoperable or unintelligible.

f. The master control station must be equipped with a silencing switch and ring-back feature such that any audible trouble signal can be silenced and must be so indicated by the lighting of an amber LED. Once any trouble condition has been corrected, the amber LED must be extinguished.

g. The master control station must be equipped with a separate, LED annunciated switch for each telephone circuit. In addition, LEDs must provide for the annunciation of operating and supervisory power.

h. The loss of operating or supervisory power must cause an audible and visual indication at the master control station and must also cause the fire alarm trouble signal to sound on the FMCU.

i. Switches, LEDs, and controls must be fully labeled.

### 2.17.3 Handsets

Handsets must have the following features:

a. Provide surface mounted remote telephone stations.

b. Each station must be equipped with a hinged door that is magnetically locked.

c. Each hand set must be permanently wired in place with a coiled cord.

d. Each hand set must be red high-impact cycolac and must be equipped with a push-to-talk switch which, when operated, must signal the master control station and a switch-equipped, storage cradle.

e. Provide operating and supervising power from the same supply circuit(s) utilized for the FMCU.

## PART 3 EXECUTION

## 3.1 VERIFYING ACTUAL FIELD CONDITIONS

Before commencing work, examine all adjoining work on which the contractor's work is in any way dependent for perfect workmanship according to the intent of this specification section, and report to the Contracting Officer's Representative any condition which prevents performance of first class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

## 3.2 INSTALLATION

### 3.2.1 Battery Cabinets

When batteries will not fit in the FMCU, locate battery cabinets below or adjacent to the FMCU. Battery cabinets must be installed at an accessible location when standing at floor level. Battery cabinets must not be installed lower than 300 mm above finished floor, measured to the bottom

of the cabinet, nor higher than 900 mm above the floor, measured to the top of the cabinet. Installing batteries above drop ceilings or in inaccessible locations is prohibited. Battery cabinets must be large enough to accommodate batteries and also to allow ample gutter space for interconnection of control units as well as field wiring. The cabinet must be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.The cabinet must be identified by an engraved phenolic resin nameplate. Lettering on the nameplate must indicate the control unit(s) the batteries power and must not be less than 25 mm high.

### 3.2.2 Notification Appliances

a. Locate notification appliance devices as required by NFPA 72 and to meet the intelligibility requirements. Where two or more visual notification appliances are located in the same room or corridor or field of view, provide synchronized operation. Devices must use screw terminals for all field wiring. Audible and visual notification appliances mounted in acoustical ceiling tiles must be centered in the tiles plus or minus 50 mm.

b. Audible and visual notification appliances mounted on the exterior of the building, within unconditioned spaces, or in the vicinity of showers must be listed weatherproof appliances installed on weatherproof backboxes.

c. Speakers must not be located in close proximity to the FMCU or LOC so as to cause feedback when the microphone is in use.

### 3.2.3 Smoke and Heat Detectors

Locate detectors as indicated on the drawings on a 100 mm mounting box. Install heat detectors not less than 100 mm from a side wall to the near edge. Heat detectors located on the wall must have the top of the detector at least 100 mm below the ceiling, but not more than 300 mm below the ceiling. Smoke detectors are permitted to be on the wall no lower than 300 mm from the ceiling with no minimum distance from the ceiling. Install smoke detectors no closer than 1 m from air handling supply diffusers. Detectors installed in acoustical ceiling tiles must be centered in the tiles plus or minus 50 mm.

### 3.2.4 LCD REMOTE Annunciator

Locate the LCD annunciator as shown on the drawings. Mount the annunciator, with the top 2 m above the finished floor or center the annunciator at m, whichever is lower.

### 3.2.5 Local Operating Console (LOC)

Locate the LOC(s) as required by NFPA 72 and as indicated. Mount the console so that the top message button and microphone is no higher than 1200 mm above the floor and the bottom (lowest) message button and microphone is at least 1-meter above the finished floor.

### 3.2.6 Ceiling Bridges

Provide ceiling bridges for ceiling-mounted appliances. Ceiling bridges must be as recommended/required by the manufacturer of the ceiling-mounted notification appliance.

## 3.3 SYSTEM FIELD WIRING

### 3.3.1 Wiring within Cabinets, Enclosures, and Boxes

Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box must be connected to screw-type terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. The use of wire nuts or similar devices is prohibited. Wiring to conform with NFPA 70.

Indicate the following in the wiring diagrams:

a. Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the FMCU and remote fire alarm/mass notification control units, initiating circuits, switches, relays and terminals.

b. Complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

### 3.3.2 Terminal Cabinets

Provide a terminal cabinet at the base of any circuit riser, on each floor at each riser, and where indicated on the drawings. Terminal size must be appropriate for the size of the wiring to be connected. Conductor terminations must be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection must be permanently mounted in the terminal cabinet. Minimum size is 200 mm by 200 mm. Only screw-type terminals are permitted. Provide an identification label, that displays "FIRE ALARM TERMINAL CABINET" with 50 mm lettering, on the front of the terminal cabinet.

### 3.3.3 Alarm Wiring

a. Voltages must not be mixed in any junction box, housing or device, except those containing power supplies and control relays.

b. Utilize shielded wiring where recommended by the manufacturer. For shielded wiring, ground the shield at only one point, in or adjacent to the FMCU.

c. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. T-tapping using screw terminal blocks is allowed for Class "B" signaling line circuits.

d. Color coding is required for circuits and must be maintained throughout the circuit. Conductors used for the same functions must be similarly color coded. Conform wiring to NFPA 70.

e. Pull all conductors splice free. The use of wire nuts, crimped

connectors, or twisting of conductors is prohibited. Where splices are unavoidable, the location of the junction box or pull box where they occur must be identified on the as-built drawings. The number and location of splices must be subject to approval by the Designated Fire Protection Engineer (DFPE).

### 3.3.4 Back Boxes and Conduit

In addition to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, provide all wiring in rigid metal conduit or intermediate metal conduit unless specifically indicated otherwise. Minimum conduit size must be 19 mm in diameter. Do not use electrical non-metallic tubing (ENT) or flexible non-metallic tubing and associated fittings.

a. Galvanized rigid steel (GRS) conduit must be utilized where exposed to weather, where subject to physical damage, and where exposed on exterior of buildings. Intermediate metal conduit (IMC) may be used in lieu of GRS as allowed by NFPA 70.

b. Electrical metallic tubing (EMT) is permitted above suspended ceilings or exposed where not subject to physical damage. Do not use EMT underground, encased in concrete, mortar, or grout, in hazardous locations, where exposed to physical damage, outdoors or in fire pump rooms. Use die-cast compression connectors.

c. For rigid metallic conduit (RMC), only threaded type fitting are permitted for wet or damp locations.

d. Flexible metal conduit is permitted for initiating device circuits 1 m in length or less. Flexible metal conduit is prohibited for notification appliance circuits and signaling line circuits. Use liquid tight flexible metal conduit in damp and wet locations.

e. Schedule 40 (minimum) polyvinyl chloride (PVC) is permitted where conduit is routed underground or underground below floor slabs. Convert non-metallic conduit, other than PVC Schedule 40 or 80, to plastic-coated rigid, or IMC, steel conduit before turning up through floor slab.

f. Exterior wall penetrations must be weathertight. Conduit must be sealed to prevent the infiltration of moisture.

### 3.3.5 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FMCU and the LOC must be provided at each conductor connection. Each conductor or cable must have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FMCU, and remote FMCU must contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing must be neat, using 12 point lettering minimum size, and mounted within each cabinet, control unit, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

## 3.4 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire-rated walls, partitions with fire-rated doors, corridor walls, and vertical service shafts in accordance with Section 07 84 00

FIRESTOPPING.

## 3.5 PAINTING

a. In unfinished areas (including areas above drop ceilings), paint all exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceway, junction boxes and covers red. In lieu of painting conduit, the contractor may utilize red conduit with a factory applied finish.

b. In finished areas, paint exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceways, junction boxes, and electrical boxes to match adjacent finishes. The inside cover of the junction box must be identified as "Fire Alarm" and the conduit must have painted red bands 19 mm wide at 3-meter centers and at each side of a floor, wall, or ceiling penetration.

c. Painting must comply with Section 09 90 00 PAINTS AND COATINGS.

## 3.6 FIELD QUALITY CONTROL

### 3.6.1 Test Procedures

Submit detailed test procedures, prepared and signed by the NICET Level III or IV Fire Alarm Technician, and the representative of the installing company, and reviewed by the QFPE 60 days prior to performing system tests. Detailed test procedures must list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, and surge protective devices. Test procedures must include sequence of testing, time estimate for each test, and sample test data forms. The test data forms must be in a check-off format (pass/fail with space to add applicable test data; similar to the forms in NFPA 72 and NFPA 4.) The test procedures and accompanying test data forms must be used for the pre-Government testing and the Government testing. The test data forms must record the test results and must:

a. Identify the NFPA Class of all Initiating Device Circuits (IDC), and Notification Appliance Circuits (NAC), Voice Notification System Circuits (NAC Audio), and Signaling Line Circuits (SLC).

b. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component, and describe how these tests must be performed.

c. Identify each component and circuit as to type, location within the facility, and unique identity within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric identity.

d. Identify all test equipment and personnel required to perform each test (including equipment necessary for smoke detector testing. The use of magnets is not permitted.

e. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals

conducting and witnessing each test.

3.6.2 Pre-Government Testing

3.6.2.1 Verification of Compliant Installation

Conduct inspections and tests to ensure that devices and circuits are functioning properly. Tests must meet the requirements of paragraph entitled "Minimum System Tests" as required by NFPA 72. The contractor and an authorized representative from each supplier of equipment must be in attendance at the pre-Government testing to make necessary adjustments. After inspection and testing is complete, provide a signed Verification of Compliant Installation letter by the QFPE that the installation is complete, compliant with the specification and fully operable. The letter must include the names and titles of the witnesses to the pre-Government tests. Provide all completion documentation as required by NFPA 72 including all referenced annex sections and the test reports noted below.

a. NFPA 72 Record of Completion.

b. NFPA 72 Record of Inspection and Testing.

c. Fire Alarm and Emergency Communication System Inspection and Testing Form.

d. Audibility test results with marked-up test floor plans.

e. Intelligibility test results with marked-up floor plans.

f. Documentation that all tests identified in the paragraph "Minimum System Tests" are complete.

3.6.2.2 Request for Government Final Test

When the verification of compliant installation has been completed, submit a formal request for Government final test to the Designated Fire Protection Engineer (DFPE)Contracting Officer's Representative (COR). Government final testing will not be scheduled until the DFPE has received copies of the request for Government final testing and Verification of Compliant Installation letter with all required reports. Government final testing will not be performed until after the connections to the installation-wide fire reporting system and the installation-wide mass notification system have been completed and tested to confirm communications are fully functional. Submit request for test at least 15 calendar days prior to the requested test date.

3.6.3 Correction of Deficiencies

If equipment was found to be defective or non-compliant with contract requirements, perform corrective actions and repeat the tests. Tests must be conducted and repeated if necessary until the system has been demonstrated to comply with all contract requirements.

3.6.4 Government Final Tests

The tests must be performed in accordance with the approved test procedures in the presence of the DFPE. Furnish instruments and personnel required for the tests. The following must be provided at the job site

for Government Final Testing:

a. The manufacturer's technical representative.

b. The contractor's Qualified Fire Protection Engineer (QFPE).

c. Marked-up red line drawings of the system as actually installed.

d. Loop resistance test results.

e. Complete program printout including input/output addresses.

f. Copy of pre-Government Test Certificate, test procedures and completed test data forms.

g. Audibility test results with marked-up floor plans.

h. Intelligibility test results with marked-up floor plans.

Government Final Tests will be witnessed by the , Designated Fire Protection EngineerContracting Officer's Representative (COR), Qualified Fire Protection Engineer (QFPE). At this time, any and all required tests noted in the paragraph "Minimum System Tests" must be repeated at their discretion.

## 3.7 MINIMUM SYSTEM TESTS

### 3.7.1 System Tests

Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:

a. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests must be witnessed by the Contracting Officer and test results recorded for use at the final Government test.

b. Verify the absence of unwanted voltages between circuit conductors and ground. The tests must be accomplished at the pre-Government test with results available at the final system test.

c. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.

d. Test each initiating device and notification appliance and circuit for proper operation and response at the control unit. Smoke detectors must be tested in accordance with manufacturer's recommended calibrated test method. Use of magnets is prohibited. Testing of duct smoke detectors must comply with the requirements of NFPA 72 except disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision must be tested at each device.

f. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.

g. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.

h. Determine that the system is operable under trouble conditions as specified.

i. Visually inspect wiring.

j. Test the battery charger and batteries.

k. Verify that software control and data files have been entered or programmed into the FMCU. Hard copy records of the software must be provided to the Contracting Officer.

l. Verify that red-line drawings are accurate.

m. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.

n. Measure voltage readings for circuits to ensure that voltage drop is not excessive.

o. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke detectors must be conducted using real smoke or the use of canned smoke which is permitted.

p. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.

q. Verify the documentation cabinet is installed and contains all as-built shop drawings, product data sheets, design calculations, site-specific software data package, and all documentation required by paragraph titled "Test Reports".

### 3.7.2 Audibility Tests

Sound pressure levels from audible notification appliances must be a minimum of 15 dBa over ambient with a maximum of 110 dBa in any occupiable area. The provisions for audible notification (audibility and intelligibility) must be met with doors, fire shutters, movable partitions, and similar devices closed.

### 3.7.3 Intelligibility Tests

Intelligibility testing of the System must be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, and ASA S3.2. Following are the specific requirements for intelligibility tests:

a. Intelligibility Requirements: Verify intelligibility by measurement after installation.

b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is .8. Rounding of values is permitted.

c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if approved by the DFPE, and if building occupants in

these areas can determine that a voice signal is being broadcast and they must walk no more than 10 m to find a location with at least the minimum required CIS value within the same area.

d. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 15 m to a location with at least the minimum required CIS value within the same area.

e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

f. The distance the occupant must walk to the location meeting the minimum required CIS value must be measured on the floor or other walking surface as follows:

(1) Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.

(2) Curving around any corners or obstructions, with a 300 mm clearance there from.

(3) Terminating directly below the location where the minimum required CIS value has been obtained.

Use commercially available test instrumentation to measure intelligibility as specified by NFPA 72 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.

## 3.8 SYSTEM ACCEPTANCE

Following acceptance of the system, as-built drawings and O&M manuals must be delivered to the Contracting Officer for review and acceptance. The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final Government test of the system. At least one set of as-built (marked-up) drawings must be provided at the time of, or prior to the Final Government Test.

a. The drawings must be prepared electronically and sized no less than the contract drawings. Furnish one set of CDs or DVDs containing software back-up and CAD based drawings in latest version of AutoCAD, DXF and portable document formats of as-built drawings and schematics.

b. Include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.

c. Include a riser diagram and drawings showing the as-built location of devices and equipment.

d. Provide Operation and Maintenance (O&M) Instructions.

In existing buildings, the transfer of devices from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O&M manuals are received.

## 3.9 INSTRUCTION OF GOVERNMENT EMPLOYEES

### 3.9.1 Instructor

Provide the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the operation, inspection, testing, and maintenance of the system provided. The instructor must train the Government employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm system. The instructor must be thoroughly familiar with all parts of this installation. The instructor must be trained in operating theory as well as in practical O&M work. Submit the instructors information and qualifications including the training history.

### 3.9.2 Required Instruction Time

Provide 8 hours of instruction after final acceptance of the system. The instruction must be given during regular working hours on such dates and times selected by the Contracting Officer. The instruction may be divided into two or more periods at the discretion of the Contracting Officer. The training must allow for rescheduling for unforeseen maintenance and/or fire department responses.

#### 3.9.2.1 Technical Training

Equipment manufacturer or a factory representative must provide 1 days of on site. Training must allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises.

### 3.9.3 Technical Training Manual

Provide, in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training must familiarize designated government personnel with proper operation of the installed system. The maintenance training course must provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

## 3.10 EXTRA MATERIALS

### 3.10.1 Repair Service/Replacement Parts

Repair services and replacement parts for the system must be available for a period of 10 years after the date of final acceptance of this work by the Contracting Officer. During the warranty period, the service technician must be on-site within 24 hours after notification. All repairs must be completed within 24 hours of arrival on-site.

During the warranty period, the installing fire alarm contractor is responsible for conducting all required testing and maintenance in accordance with the requirements and recommended practices of NFPA 72 and the system manufacturers. Installing fire alarm contractor is NOT responsible for any damage resulting from abuse, misuse, or neglect of equipment by the end user.

### 3.10.2 Spare Parts

Spare parts furnished must be directly interchangeable with the corresponding components of the installed systems. Spare parts must be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts must be delivered to the Contracting Officer at the time of the Government testing and must be accompanied by an inventory list.

### 3.10.3 Document Storage Cabinet

Upon completion of the project, but prior to project close-out, place in the document storage cabinet copies of the following record documentation:

a. As-built shop drawings

b. Product data sheets

c. Design calculations

d. Site-specific software data package

e. All documentation required by SD-06.

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SECTION 31 00 00

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**08/08**

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# SECTION 31 00 00

# EARTHWORK
**08/08**

## PART 1 GENERAL

### 1.1 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are not indicated. Actual topographic survey not conducted.

b. Pipes or other artificial obstructions, will be encountered.

### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1102 | (2014) Method of Test for Sieve Analysis of Aggregates |
| JIS A 1103 | (2014) Method of Test for Amount of Material Passing Test Sieve 75 μm in Aggregates |
| JIS A 1205 | (2009) Test Method for Liquid Limit and Plastic Limit of Soils |
| JIS A 1210 | (2009) Test Method for Soil Compaction Using a Rammer |
| JIS A 1214 | (2013) Test Method for Soil Density by the Sand Replacement Method |
| JIS A 1218 | (2013) Test Methods for Permeability of Saturated Soils |
| JIS A 5001 | (2008) Crushed Stone for Road Construction |
| JIS A 5005 | (2020) Crushed Stone and Manufactured Sand for Concrete |

JAPANESE GEOTECHNICAL SOCIETY (JGS)

| | |
|---|---|
| JGS 0051 | (2000) Method of Classification of Geomaterials for Engineering Purposes |
| JGS 1614 | (2003) Test Method for Soil Density Using Nuclear Gauge |

## 1.3 DEFINITIONS

### 1.3.1 Satisfactory Materials

Satisfactory materials comprise any materials classified by JGS 0051 as G, G-M, G-C, G-O, G-V, GM, GC, GO, GV, S, S-M, S-C, S-O, S-V, SM, SC, SO, SV, ML, MH, CL, CH, OL, OH, OV, VH1, VH2. Satisfactory materials for grading comprise stones less than 200 mm, except for fill material for pavements which comprise stones less than 75 mm in any dimension.

### 1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter. Notify the Contracting Officer when encountering any contaminated materials.

### 1.3.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in JGS 0051 as G, G-M, G-C, S, S-M, S-C. Cohesive materials include materials classified as GC, SC, ML, CL, MH, CH. Materials classified as GM, SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with JIS A 1205, JIS A 1102 and JIS A 1103.

### 1.3.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in JIS A 1210 (Methods C,D,E - non repeating method) abbreviated as a percent of laboratory maximum density (Modified Proctor Test).

### 1.3.5 Topsoil

Material suitable for topsoils obtained from excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than 25 mm diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

### 1.3.6 Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

### 1.3.7 Select Granular Material

#### 1.3.7.1 General Requirements

Select granular material consist of materials classified as G, G-M, G-C, S, S-M, S-C by JGS 0051 where indicated. The liquid limit of such material must not exceed 35 percent when tested in accordance with JIS A 1205. The plasticity index must not be greater than 12 percent when tested in accordance with JIS A 1205, and not more than 35 percent by weight may be finer than 75 micrometers sieve when tested in accordance with JIS A 1103.

Provide a minimum coefficient of permeability of 0.01 mm per second when tested in accordance with JIS A 1218.

## 1.4 SYSTEM DESCRIPTION

### 1.4.1 Classification of Excavation

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation. Finish the specified excavation on a classified basis, in accordance with the following designations and classifications.

#### 1.4.1.1 Common Excavation

Include common excavation with the satisfactory removal and disposal of all materials.

### 1.4.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

## 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring; G

Dewatering Work Plan; G

SD-03 Product Data

Utilization of Excavated Materials; G

SD-06 Test Reports

Testing; G

# PART 2 PRODUCTS

## 2.1 BURIED WARNING AND IDENTIFICATION TAPE

Provide polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

| Warning Tape Color Codes | |
|---|---|
| Red | Electric |
| Orange | Telephone and Other Communications |
| Blue | Water Systems |
| Green | Sewer Systems |

2.1.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.08 mm and a minimum strength of 10.3 MPa lengthwise, and 8.6 MPa crosswise, with a maximum 350 percent elongation.

2.1.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.10 mm, and a minimum strength of 10.3 MPa lengthwise and 8.6 MPa crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 920 mm deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.2 DETECTION WIRE FOR NON-METALLIC PIPING

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.3 CAPILLARY WATER BARRIER

Provide capillary water barrier of clean, poorly graded crushed rock, crushed gravel, or uncrushed gravel placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below. Conform to JIS A 5005 for fine aggregate grading with a maximum of 3 percent by weight passing JIS A 1103, 75 micrometers sieve, or 37.5 mm and no more than 2 percent by weight passing the 4.75 mm size sieve or coarse aggregate with "S-x" designation (where x is the maximum nominal gravel size) in accordance with JIS A 5001.

PART 3 EXECUTION

3.1 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill or embankment in areas approved for surplus material storage or designated waste areas. Dispose unsatisfactory excavated material in designated

waste or spoil areas. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times.

### 3.1.1 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Operate dewatering system continuously until construction work below existing water levels is complete.

### 3.1.2 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended in the manufacturer's printed installation manual.

#### 3.1.2.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe.

#### 3.1.2.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, remove such material 100 mm below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

#### 3.1.2.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

#### 3.1.2.4 Excavation for Appurtenances

Provide excavation for structures of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Remove loose disintegrated rock and thin strata. Specify removal of unstable material. When concrete or masonry is to be placed in an excavated area, take special care not to disturb the bottom of the excavation. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

### 3.1.3 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Report

damage to utility lines or subsurface construction immediately to the Contracting Officer.

### 3.1.4 Structural Excavation

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement.

## 3.2 SHORING

### 3.2.1 General Requirements

Submit a Shoring and Sheeting plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Finish shoring, including sheet piling, and install as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Remove shoring, bracing, and sheeting as excavations are backfilled, in a manner to prevent caving.

## 3.3 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory and unsatisfactory as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times.

## 3.4 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Only use excavation methods that will leave the foundation rock in a solid and unshattered condition. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect shales from slaking and all surfaces from erosion resulting from ponding or water flow.

## 3.5 GROUND SURFACE PREPARATION

### 3.5.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 150 mm before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 150 mm, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 300 mm and compact it as specified for the adjacent fill.

### 3.5.2 Material

Do not place material on surfaces that are muddy.

## 3.6 UTILIZATION OF EXCAVATED MATERIALS

Dispose unsatisfactory materials removing from excavations into designated waste disposal or spoil areas. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unused satisfactory material. Submit proposed source of borrow material. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Clear and grub newly designated waste areas on Government-controlled land before disposal of waste material thereon. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

## 3.7 BURIED TAPE AND DETECTION WIRE

### 3.7.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 300 mm below finished grade; under pavements and slabs, bury tape 150 mm below top of subgrade.

### 3.7.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed 300 mm above the top of pipe. Extend the wire continuously and unbroken, from manhole to manhole. Terminate the ends of the wire inside the manholes at each end of the pipe, with a minimum of 0.9 m of wire, coiled, remaining accessible in each manhole. Furnish insulated wire over it's entire length. Install wires at manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal.

## 3.8 BACKFILLING AND COMPACTION

Place backfill adjacent to any and all types of structures, in successive horizontal layers of loose materia not more than 200 mm in depth. Compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials in accordance with JIS A 1210, to prevent wedging action or eccentric loading upon or against the structure. Backfill material must be within the range of -2 to +2 percent of optimum moisture content at the time of compaction.

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs GROUND SURFACE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

### 3.8.1 Trench Backfill

Backfill trenches to the grade shown. Leave the joints and couplings uncovered during the pressure test. Do not backfill the trench until all

specified tests are performed.

3.8.1.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with select granular material or initial backfill material.

3.8.1.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with select granular material placed in layers not exceeding 150 mm loose thickness.

3.8.1.3 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least 300 mm above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with as shown in design drawings, except as specified herein. Compact backfill to top of pipe to 90 percent of JIS A 1210 maximum density. Provide plastic piping with bedding to spring line of pipe. Provide materials as follows:

3.8.1.3.1 Sand

Clean, coarse-grained sand classified as S, S-M, S-C by JGS 0051 for bedding and in conformance with JIS A 5005.

3.8.1.4 Final Backfill

Fill the remainder of the trench with satisfactory material. Place backfill material and compact as follows:

3.8.1.4.1 Roadways

Place backfill up to the required elevation as specified.

3.8.1.4.2 Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 300 mm loose thickness, and compact it to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Allow water flooding or jetting methods of compaction for granular noncohesive backfill material. Do not allow water jetting to penetrate the initial backfill. Apply this requirement to all other areas not specifically designated above.

3.8.2 Backfill for Appurtenances

After the structure has been constructed and the concrete has been allowed to cure for 7 days, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

## 3.9 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

### 3.9.1 Water Lines

Excavate trenches to a depth that provides a minimum cover of 0.90 meters from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe. For fire protection yard mains or piping, an additional 0.90 mm of cover is required.

### 3.9.2 Electrical Distribution System

Provide a minimum cover of 600 mm from the finished grade to direct burial cable and conduit or duct line, unless otherwise indicated.

## 3.10 SUBGRADE PREPARATION

### 3.10.1 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, disking, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with satisfactory excavated material or other approved material as directed. Excavate rock encountered in the cut section to a depth of 150 mm below finished grade for the subgrade. Bring up low areas resulting from removal of unsatisfactory material or excavation of rock to required grade with satisfactory materials, and shape the entire subgrade to line, grade, and cross section and compact as specified. Do not vary the elevation of the finish subgrade more than 15 mm from the established grade and cross section.

### 3.10.2 Compaction

Finish compaction by vibratory compactors, or other approved equipment. C ompact each layer of the embankment to at least 90 percent of laboratory maximum density.

#### 3.10.2.1 Subgrade for Pavements

Compact subgrade for pavements to at least 90 percentage laboratory maximum density in accordance with JIS A 1210 for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, thoroughly blend, reshape, and compact the top 300 mm of subgrade.

## 3.11 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 30 mm of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to

acceptance of the work, and re-established grades to the required elevations and slopes.

### 3.11.1 Capillary Water Barrier

Place a capillary water barrier under concrete floor and area-way slabs grade directly on the subgrade and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

### 3.11.2 Grading Around Structures

Construct areas within 1.5 m outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

## 3.12 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subgrade soil to a 50 mm depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of 75 mm and grade to the elevations and slopes shown. Do not spread topsoil when excessively wet or dry. Obtain material required for topsoil in excess of that produced by excavation within the grading limits.

## 3.13 TESTING

Perform testing by a Government validated commercial testing laboratory or the Contractor's validated testing facility. Submit qualifications of the Government validated commercial testing laboratory or the Contractor's validated testing facilities.

a. Determine field in-place density in accordance with JIS A 1214, JGS 1614. When JGS 1614 is used, check the calibration curves and adjust using only the sand cone method as described in JIS A 1214. results in a wet unit weight of soil in determining the moisture content of the soil when using this method.

b. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in JGS 1614; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.

c. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

### 3.13.1 Fill and Backfill Material Gradation

One test per 5000 cubic meters stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with

JIS A 1102 JIS A 1103.

3.13.2 In-Place Densities

a. One test per 1000 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 500 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

3.13.3 Check Tests on In-Place Densities

If JGS 1614 is used, check in-place densities by JIS A 1214 as follows:

a. One check test for each 10 field tests performed using JGS 1614.

3.13.4 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material to determine the optimum moisture and laboratory maximum density values. One representative test per 5000 cubic meters of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.13.5 Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION during construction of the subgrades.

3.14 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber from Government property to a location approved by the Contracting Officer..

-- End of Section --

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DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 05 33

LANDSCAPE ESTABLISHMENT

**08/17**

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# SECTION 32 05 33

# LANDSCAPE ESTABLISHMENT
**08/17**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

MLIT-PWCS (2011) Planting Work Common Specifications

### 1.2 DEFINITIONS

#### 1.2.1 Pesticide

Any substance or mixture of substances, including biological control agents, that may prevent, destroy, repel, or mitigate pests and are specifically labeled for use by the U.S. Environmental Protection Agency (EPA). Also, any substance used as a plant regulator, defoliant, disinfectant, or biocide. Examples of pesticides include fumigants, herbicides, insecticides, fungicides, nematicides, molluscicides and rodenticides.

#### 1.2.2 Stand of Turf

100 percent ground cover of the established species.

### 1.3 RELATED REQUIREMENTS

Section 32 92 23 SODDING applies to this section for installation of sod requirements, with additions and modifications herein.

### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fertilizer; G

SD-07 Certificates

Maintenance Inspection Report; G

Plant Quantities; G

## 1.5 DELIVERY, STORAGE AND HANDLING

### 1.5.1 Delivery

Deliver fertilizer, to the site in original containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to local and federal laws.

### 1.5.2 Storage

#### 1.5.2.1 Fertilizer Storage

Store material in designated areas. Store fertilizer in cool, dry locations away from contaminants.

### 1.5.3 Handling

Do not drop or dump materials from vehicles.

# PART 2 PRODUCTS

## 2.1 POST-PLANT FERTILIZER

### 2.1.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

10 percent available nitrogen
10 percent available phosphorus
10 percent available potassium

## 2.2 WATER

Source of water must be approved by the Contracting Officer, and be of suitable quality for irrigation.

## 2.3 PESTICIDES

Use approved biological pest controls as approved in the Plan.

# PART 3 EXECUTION

## 3.1 EXTENT OF WORK

Provide landscape construction maintenance in accordance with planting operations per MLIT-PWCS for all newly installed , unless indicated otherwise, and at all areas inside or outside the limits of the construction that are disturbed by the Contractor's operations.

### 3.1.1 Policing

Police all landscaped areas. Policing includes removal of dead vegetation, paper, trash, cigarette butts, garbage, rocks or other debris. Collected debris must be promptly removed and disposed of at an approved disposal site.

### 3.1.2 Drainage System Maintenance

Remove all obstructions from surface and subsurface drain lines to allow water to flow unrestricted in swales, gutters, catch basins, storm drain curb inlets, and yard drains. Remove grates and clear debris in catch basins. Open drainage channels are to be maintained free of all debris and vegetation at all times. Edges of these channels must be clear of any encroachment by vegetation.

## 3.2 GROUNDCOVER ESTABLISHMENT PERIOD

Groundcover establishment period will commence on the date that inspection by the Contracting Officer shows that the turf furnished under this contract has been satisfactorily installed to a 100 percent stand of coverage. The establishment period must continue for a period of 365 days.

### 3.2.1 Frequency of Maintenance

Begin maintenance immediately after turf has been installed . Inspect area s once a week during the installation and establishment period and perform needed maintenance promptly.

### 3.2.2 Promotion of Growth

Maintain groundcover in a manner that promotes proper health, growth, natural color. Turf must have a neat uniform manicured appearance, free of bare areas, ruts, holes, weeds, pests, dead vegetation, debris, and unwanted vegetation that present an unsightly appearance. Mow, remove excess clippings, eradicate weeds, water, fertilize, and perform other operations necessary to promote growth, as approved by Contracting Officer. Remove noxious weeds common to the area from planting areas by mechanical means.

### 3.2.3 Mowing

#### 3.2.3.1 Turf

Mow turf at a uniform finished height. Mow turfed areas to a minimum average height of 30 mm when average height of grass becomes 60 mm. The height of turf is measured from the soil. Perform mowing of turf in a manner that prevents scalping, rutting, bruising, uneven and rough cutting. Prior to mowing, all rubbish, debris, trash, leaves, rocks, and paper on a turf area must be picked up and disposed. Adjacent paved areas must be swept/vacuumed clean.

### 3.2.4 Post-Fertilizer Application

Apply turf fertilizer in a manner that promotes health, growth, vigor, color and appearance of cultivated turf areas. The method of application, fertilizer type and frequencies must be determined by the laboratory soil analysis results the requirements of the particular turf species. Organic fertilizer must be used. In the event that organic fertilizer is not producing the desired effect, the Contractor must contract the Contracting Officer for approval prior to the use of a synthetic type of fertilizer. Apply fertilizer by approved methods in accordance with the manufacturer's recommendations.

### 3.2.5 Turf Watering

Perform irrigation in a manner that promotes the health, growth, color and appearance of cultivated vegetation and that complies with all Federal, State, and local water agencies and authorities directives. The Contractor must be responsible to prevent over watering, water run-off, erosion, and ponding due to excessive quantities or rate of application. Abide by federal, local or other water conservation regulations or restrictions in force during the establishment period. Adjust irrigation controllers to comply with the water conservation regulations schedule.

### 3.2.6 Turf Aeration

Upon completion of weed eradication operations and Contracting Officer's approval to proceed, aerate turf areas by approved device. Core, by pulling soil plugs, to a minimum depth of 30 mm. Leave all soil plugs that are produced in the turf area.

### 3.2.7 Final Inspection and Acceptance

Final inspection will be make upon written request from the Contractor at least 10 days prior to the last day of the turf establishment period. Final turf acceptance will be based upon a satisfactory stand of turf.

## 3.3 FIELD QUALITY CONTROL

### 3.3.1 Maintenance Inspection Report

Provide maintenance inspection report to assure that landscape maintenance is being performed in accordance with the specifications and in the best interest of plant growth and survivability. Site observations must be documented at the start of the establishment period, then quarterly following the start, and at the end of establishment period. Submit results of site observation visits to the Contracting Officer within 7 calendar days of each site observation visit.

### 3.3.2 Plant Quantities

Provide total exterior area of landscaping such as turf.

-- End of Section --

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# SECTION 32 11 20

# SUBBASES FOR FLEXIBLE PAVING
**08/17**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1102 | (2014) Method of Test for Sieve Analysis of Aggregates |
| JIS A 1103 | (2014) Method of Test for Amount of Material Passing Test Sieve 75 µm in Aggregates |
| JIS A 1104 | (2006) Methods of Test for Density and Water Absorption of Fine Aggregates |
| JIS A 1121 | (2007) Method of Test for Resistance to Abrasion of Coarse Aggregate by Use of the Los Angeles Machine |
| JIS A 1201 | (2009) Practise for Preparing Disturbed Soil Samples for Soil Testing |
| JIS A 1205 | (2009) Test Method for Liquid Limit and Plastic Limit of Soils |
| JIS A 1210 | (2009) Test Method for Soil Compaction Using a Rammer |
| JIS A 1214 | (2013) Test Method for Soil Density by the Sand Replacement Method |
| JIS A 5001 | (2008) Crushed Stone for Road Construction |
| JIS Z 8801 | (2006) Test Sieves Part 1: Test Sieves of Metal Wire Cloth |

JAPANESE GEOTECHNICAL SOCIETY (JGS)

| | |
|---|---|
| JGS 0051 | (2000) Method of Classification of Geomaterials for Engineering Purposes |

### 1.2 DEGREE OF COMPACTION

Degree of compaction required is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in JIS A 1210 abbreviated as a percent of laboratory maximum dry density.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G

SD-06 Test Reports

Initial Tests; G

In-Place Tests; G

## 1.4 EQUIPMENT, TOOLS, AND MACHINES

All plant, equipment, and tools used in the performance of the work will be subject to approval by the Contracting Officer before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Use equipment capable of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

## 1.5 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements and perform testing at the specified frequency. The Contracting Officer may specify the time and location of the tests. Furnish copies of test results to the Contracting Officer within 24 hours of completion of the tests.

### 1.5.1 Sampling

Take samples for laboratory testing in conformance with JIS A 1201. When deemed necessary, the sampling will be observed by the Contracting Officer.

### 1.5.2 Tests

#### 1.5.2.1 Sieve Analysis

Perform sieve analysis in conformance with JIS A 1103 and JIS A 1102 using sieves conforming to JIS Z 8801.

#### 1.5.2.2 Liquid Limit and Plasticity Index

Determine liquid limit and plasticity index in accordance with JIS A 1205.

#### 1.5.2.3 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture in

accordance with paragraph DEGREE OF COMPACTION.

#### 1.5.2.4 Field Density Tests

Measure field density in accordance with JIS A 1214.

#### 1.5.2.5 Wear Test

Perform wear tests on subbase course material in conformance with JIS A 1121.

#### 1.5.2.6 Weight of Slag

Determine weight per cubic meter of slag in accordance with JIS A 1104.

## 1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 2 degrees C. When the temperature falls below 2 degrees C, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

# PART 2 PRODUCTS

## 2.1 MATERIALS

### 2.1.1 Flexible Paving Subbase Course

Provide aggregates conforming to JIS A 5001, C-40/RC-40consisting of crushed stone or slag, gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Provide aggregates which are free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. The percentage of loss of material retained on the 4.75 mm sieve must not exceed 50 percent after 500 revolutions when tested in accordance with JIS A 1121. Provide aggregate that is reasonably uniform in density and quality. Provide slag that is an air-cooled, blast-furnace product having a dry weight of not less than 1050 kg/cubic meter. Provide aggregates with a maximum size of 37.5 mm for C-40/RC-40 and within the limits specified as follows:

Maximum Allowable Percentage by Weight
Passing Square-Mesh Sieve

| Sieve Designation (mm) | C-40 /RC-40 |
|---|---|
| 53.0 | 100 |
| 37.5 | 95-100 |
| 31.5 | ---- |
| 26.5 | ---- |
| 19 | 50-80 |
| 13.2 | ---- |
| 4.75 | 15-40 |
| 2.36 | 5-25 |

The portion of any blended component and of the completed course passing the 0.425 mm must be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

## 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.2.1 Initial Tests

Perform one of each of the following tests on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation. Complete this testing for each source if materials from more than one source are proposed.

a. Sieve Analysis.

b. Liquid limit and plasticity index.

c. Moisture-density relationship.

d. Wear.

e. Weight per cubic meter of Slag.

Submit certified copies of test results for approval not less than 30 days before material is required for the work.

### 2.2.2 Approval of Material

Tentative approval of material will be based on initial test results.

# PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area.

## 3.2 STOCKPILING MATERIAL

Clear and level storage sites prior to stockpiling of material. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Stockpile materials obtained from different sources separately.

## 3.3 PREPARATION OF UNDERLYING COURSE OR SUBGRADE

Clean the underlying course or subgrade of all foreign substances prior to constructing the subbase course. Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in JGS 0051, stabilize the surface prior to placement of the overlying course. Stabilize by mixing the overlying course material into the underlying course and compacting by approved methods. Consider the stabilized material as part of the underlying course and meet all requirements of the underlying course. Do not allow traffic or other operations to disturb the finished underlying course and maintain in a satisfactory condition until the overlying course is placed.

## 3.4 GRADE CONTROL

Provide a finished and completed subbase courses conforming to the lines, grades, and cross sections shown. Place line and grade stakes as necessary for control.

## 3.5 MIXING AND PLACING MATERIALS

Mix and place the materials to obtain uniformity of the material at the water content specified. Make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

## 3.6 LAYER THICKNESS

Compact the completed course to the thickness indicated. No individual layer may be thicker than 150 mm nor be thinner than 75 mm in compacted thickness. Compact the course(s) to a total thickness that is within 13 mm of the thickness indicated. Where the measured thickness is more than 13 mm deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 13 mm thicker than indicated, the course will be considered as conforming to the specified thickness requirements.

The average job thickness will be the average of all thickness measurements taken for the job and must be within 6 mm of the thickness indicated. Measure the total thickness of the course(s) at intervals of one measurement for each 500 square meters of completed course. Measure total thickness using 75 mm diameter test holes penetrating the completed course.

## 3.7 COMPACTION

Compact each layer of the material, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of optimum water content determined from laboratory tests as specified in this Section. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. Continue compaction of the subbase until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. Make such adjustments in compacting or finishing procedures as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory subbase course. Remove any materials that are found to be unsatisfactory and replace with satisfactory material or rework, as directed, to meet the requirements of this specification.

## 3.8 EDGES OF SUBBASE COURSE

Place approved material along the outer edges of the subbase course in sufficient quantity to compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, simultaneously roll and compact at least a 600 mm width of this shoulder material with the rolling and compacting of each layer of the subbase course, as directed.

## 3.9 SMOOTHNESS TEST

Construct the top layer so that the surface shows no deviations in excess of 10 mm when tested with a 3.00 m straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Also take measurements perpendicular to the centerline at 15 meter intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

## 3.10 FIELD QUALITY CONTROL

### 3.10.1 In-Place Tests

Perform one of each of the following tests on samples taken from the placed and compacted subbase course. Take samples and test at the rates indicated.

a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 500 square meters, or portion thereof, of completed area.

b. Perform sieve analysis on every lift of material placed and at a frequency of one sieve analysis for every 1,000 square meters, or portion thereof, of material placed.

c. Perform liquid limit and plasticity index tests at the same frequency as the sieve analysis.

d. Measure the thickness of each course at intervals providing at least one measurement for each 500 square meters or part thereof. Measure the thickness using test holes, at least 75 mm in diameter through the course.

### 3.10.2 Approval of Material

Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and fully compacted course(s).

## 3.11 MAINTENANCE

Maintain the completed course in a satisfactory condition until the full pavement section is completed and accepted. Immediately repair any defects and repeat repairs as often as necessary to keep the area intact. Retest any course that was not paved over prior to the onset of winter to verify that it still complies with the requirements of this specification. Rework or replace any area that is damaged as necessary to comply with this specification.

## 3.12 DISPOSAL OF UNSATISFACTORY MATERIALS

Dispose of any unsuitable materials that have been removed as directed . No additional payments will be made for materials that have to be replaced.

-- End of Section --

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# SECTION 32 11 23

# AGGREGATE BASE COURSES
**08/17**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1102 | (2014) Method of Test for Sieve Analysis of Aggregates |
| JIS A 1103 | (2014) Method of Test for Amount of Material Passing Test Sieve 75 µm in Aggregates |
| JIS A 1104 | (2006) Methods of Test for Density and Water Absorption of Fine Aggregates |
| JIS A 1109 | (2006) Method of Test for Density and Water Absorption of Fine Aggregates |
| JIS A 1110 | (2006) Methods of Test for Density and Water Absorption of Coarse Aggregates |
| JIS A 1112 | (2012) Method of Test for Washing Analysis of Fresh Concrete |
| JIS A 1121 | (2007) Method of Test for Resistance to Abrasion of Coarse Aggregate by Use of the Los Angeles Machine |
| JIS A 1201 | (2009) Practise for Preparing Disturbed Soil Samples for Soil Testing |
| JIS A 1205 | (2009) Test Method for Liquid Limit and Plastic Limit of Soils |
| JIS A 1210 | (2009) Test Method for Soil Compaction Using a Rammer |
| JIS A 1214 | (2013) Test Method for Soil Density by the Sand Replacement Method |
| JIS A 5001 | (2008) Crushed Stone for Road Construction |
| JIS Z 8801 | (2006) Test Sieves Part 1: Test Sieves of Metal Wire Cloth |

JAPANESE GEOTECHNICAL SOCIETY (JGS)

| | |
|---|---|
| JGS 0051 | (2000) Method of Classification of Geomaterials for Engineering Purposes |

## 1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

### 1.2.1 Aggregate Base Course

Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

### 1.2.2 Graded-Crushed Aggregate Base Course

Graded-crushed aggregate (GCA) base course is well graded, crushed, durable aggregate uniformly moistened and mechanically stabilized by compaction.

### 1.2.3 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in JIS A 1210 abbreviated as a percent of laboratory maximum dry density.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G

SD-06 Test Reports

Initial Tests; G

In-Place Tests; G

## 1.4 EQUIPMENT, TOOLS, AND MACHINES

All plant, equipment, and tools used in the performance of the work will be subject to approval by the Contracting Officer before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Use equipment capable of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

## 1.5 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor. Work

requiring testing will not be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements and perform testing at the specified frequency. The Contracting Officer may specify the time and location of the tests. Furnish copies of test results to the Contracting Officer within 24 hours of completion of the tests.

1.5.1 Sampling

Take samples for laboratory testing in conformance with JIS A 1201. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.5.2 Tests

1.5.2.1 Sieve Analysis

Perform sieve analysis in conformance with JIS A 1103 and JIS A 1102 using sieves conforming to JIS Z 8801. .

1.5.2.2 Liquid Limit and Plasticity Index

Determine liquid limit and plasticity index in accordance with JIS A 1205.

1.5.2.3 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture content in accordance with paragraph DEGREE OF COMPACTION.

1.5.2.4 Field Density Tests

Measure field density in accordance with JIS A 1214.

1.5.2.5 Wear Test

Perform wear tests on ABC and GCA course material in conformance with JIS A 1121.

1.5.2.6 Soundness

Perform soundness tests on GCA in accordance with JIS A 1112.

1.5.2.7 Weight of Slag

Determine weight per cubic meter of slag in accordance with JIS A 1104 on the ABC and GCA course material.

1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 2 degrees C. When the temperature falls below 2 degrees C, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

PART 2 PRODUCTS

2.1 AGGREGATES

Provide Aggregate Base Course (ABC) and Graded-Crushed Aggregate (GCA)

base course consisting of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. Provide ABC that is free of lumps of clay, organic matter, and other objectionable materials or coatings. Provide GCA that is free of silt and clay as defined by JGS 0051, organic matter, and other objectionable materials or coatings. The portion retained on the 4.75 mm sieve is known as coarse aggregate; that portion passing the 4.75 mm sieve is known as fine aggregate. Base course shall conform to JIS A 5001, M-40/RM-40. When the coarse and fine aggregate is supplied form more than one source, provide aggregate from each source that meets the specified requirements.

2.1.1 Coarse Aggregate

Provide coarse aggregates with angular particles of uniform density. Separately stockpile coarse aggregate supplied from more than one source.

a. Crushed Gravel: Provide crushed gravel that has been manufactured by crushing gravels and that meets all the requirements specified below.

b. Crushed Stone: Provide crushed stone consisting of freshly mined quarry rock, meeting all the requirements specified below.

c. Crushed Recycled Concrete: Provide crushed recycled concrete consisting of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. Provide recycled concrete that is free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and that has been crushed and processed to meet the required gradations for coarse aggregate. Reject recycled concrete aggregate exceeding this value. Provide crushed recycled concrete that meets all other applicable requirements specified below.

d. Crushed Slag: Provide crushed slag that is an air-cooled blast-furnace product having an air dry unit weight of not less than 1120 kg/cubic meter as determined by JIS A 1104, and meets all the requirements specified below.

2.1.1.1 Aggregate Base Course

The percentage of loss of ABC coarse aggregate must not exceed 50 percent when tested in accordance with JIS A 1121.

2.1.1.2 Graded-Crushed Aggregate Base Course

The percentage of loss of GCA coarse aggregate must not exceed 40 percent loss when tested in accordance with JIS A 1121. Provide GCA coarse aggregate that does not exhibit a loss greater than 18 percent weighted average, at five cycles, when tested for soundness in magnesium sulfate, or 12 percent weighted average, at five cycles, when tested in sodium sulfate in accordance with JIS A 1112.

2.1.2 Fine Aggregate

Provide fine aggregates consisting of angular particles of uniform density.

2.1.2.1 Aggregate Base Course

Provide ABC fine aggregate that consists of screenings, angular sand,

crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.1.2.2 Graded-Crushed Aggregate Base Course

Provide GCA fine aggregate consisting of angular particles produced by crushing stone, slag, recycled concrete, or gravel that meets the requirements for wear and soundness specified for GCA coarse aggregate. Produce fine aggregate by crushing only particles larger than 4.75 mm sieve in size. Provide fine aggregate that contains at least 90 percent by weight of particles having two or more freshly fractured faces in the portion passing the 4.75 mm sieve and retained on the 2 mm sieve, and in the portion passing the 2 mm sieve and retained on the 0.425 mm sieve. Manufacture fine aggregate from gravel particles 95 percent of which by weight are retained on the 12.5 mm sieve.

2.1.3 Gradation Requirements

Apply the specified gradation requirements to the completed base course. Provide aggregates that are continuously well graded within the limits specified in TABLE 1. Use sieves that conform to JIS Z 8801.

TABLE 1. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

| Sieve Designation (mm) | M-40 / RM-40 |
|---|---|
| 53.0 | 100 |
| 37.5 | 95-100 |
| 31.5 | ---- |
| 26.5 | ---- |
| 19.0 | 60-90 |
| 13.2 | ---- |
| 4.75 | 30-65 |
| 2.36 | 20-50 |
| 1.18 | ---- |
| 0.425 | 10-30 |
| 0.075 | 2-10 |

NOTE 1: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, test the materials in accordance with JIS A 1110 and JIS A 1109 to determine their specific gravities. Correct the percentages passing the various sieves as directed by the Contracting Officer if the specific gravities vary by more than 10 percent.

## 2.2 LIQUID LIMIT AND PLASTICITY INDEX

Apply liquid limit and plasticity index requirements to the completed course and to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the 0.425 mm sieve must be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

## 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.3.1 Initial Tests

Perform one of each of the following tests, on the proposed material prior to commencing construction, to demonstrate that the proposed material meets all specified requirements when furnished. Complete this testing for each source if materials from more than one source are proposed.

a. Sieve Analysis.

b. Liquid limit and plasticity index.

c. Moisture-density relationship.

d. Wear.

e. Soundness.

f. Weight per cubic meter of Slag.

Submit certified copies of test results for approval not less than 30 days before material is required for the work.

2.3.2 Approval of Material

Tentative approval of material will be based on initial test results.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the ABC or GCA is constructed in more than one layer, clean the previously constructed layer of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area.

3.2 STOCKPILING MATERIAL

Clear and level storage sites prior to stockpiling of material. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Stockpile materials obtained from different sources separately.

3.3 PREPARATION OF UNDERLYING COURSE OR SUBGRADE

Clean the underlying course or subgrade of all foreign substances prior to constructing the base course(s). Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in JGS 0051, stabilize the surface prior to placement of the base course(s). Stabilize by mixing ABC or GCA into the underlying course and compacting by approved methods. Consider the stabilized material as part of the underlying course and meet all requirements of the underlying course. Do not allow traffic or other operations to disturb the finished underlying course and maintain in a satisfactory condition until the base course is placed.

3.4 GRADE CONTROL

Provide a finished and completed base course conforming to the lines, grades, and cross sections shown. Place line and grade stakes as

necessary for control.

## 3.5 MIXING AND PLACING MATERIALS

Make adjustments in mixing procedures or in equipment, as directed, to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory base course meeting all requirements of this specification. Place the mixed material on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. Place the layers so that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the base course is placed in more than one layer, clean the previously constructed layers of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Make adjustments in placing procedures or equipment as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable base course.

## 3.6 LAYER THICKNESS

Compact the completed base course to the thickness indicated. No individual layer may be thicker than 150 mm nor be thinner than 75 mm in compacted thickness. Compact the base course(s) to a total thickness that is within 13 mm of the thickness indicated. Where the measured thickness is more than 13 mm deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 13 mm thicker than indicated, the course will be considered as conforming to the specified thickness requirements. The average job thickness will be the average of all thickness measurements taken for the job and must be within 6 mm of the thickness indicated. Measure the total thickness of the base course at intervals of one measurement for each 500 square meters of base course. Measure total thickness using 75 mm diameter test holes penetrating the base course.

## 3.7 COMPACTION

Compact each layer of the base course, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of the optimum water content determined from laboratory tests as specified in this Section. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. Continue compaction until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. Make such adjustments in compacting or finishing procedures as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory base course. Remove any materials found to be unsatisfactory and replace with satisfactory material or rework, as directed, to meet the requirements of this specification.

## 3.8 EDGES OF BASE COURSE

Place the base course(s) so that the completed section will be a minimum of 600 mm wider, on all sides, than the next layer that will be placed above it. Place approved material along the outer edges of the base course in sufficient quantity to compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, simultaneously roll and compact at least a 600 mm width of this shoulder material with the rolling and compacting of each layer of the base course, as directed.

## 3.9 FINISHING

Finish the surface of the top layer of base course after final compaction and proof rolling by cutting any overbuild to grade and rolling with a steel-wheeled roller. Do not add thin layers of material to the top layer of base course to meet grade. If the elevation of the top layer of base course is 13 mm or more below grade, scarify the top layer to a depth of at least 75 mm and blend new material in and compact and proof roll to bring to grade. Make adjustments to rolling and finishing procedures as directed by the Contracting Officer to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, scarify the unsatisfactory portion and rework and recompact it or replace as directed.

## 3.10 SMOOTHNESS TEST

Construct the top layer so that the surface shows no deviations in excess of 10 mm when tested with a 3.00 meter straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Also take measurements perpendicular to the centerline at 15 meter intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

## 3.11 FIELD QUALITY CONTROL

### 3.11.1 In-Place Tests

Perform each of the following tests on samples taken from the placed and compacted ABC and GCA. Take samples and test at the rates indicated. Perform sampling and testing of recycled concrete aggregate at twice the specified frequency until the material uniformity is established.

a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 250 square meters, or portion thereof, of completed area.

b. Perform sieve analysis on every lift of material placed and at a frequency of one sieve analysis for every 500 square meters, or portion thereof, of material placed.

c. Perform liquid limit and plasticity index tests at the same frequency as the sieve analysis.

d. Measure the thickness of the base course at intervals providing at least one measurement for each 500 square meters of base course or part thereof. Measure the thickness using test holes, at least 75 mm

in diameter through the base course.

3.11.2 Approval of Material

Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and fully compacted course(s).

3.12 TRAFFIC

For roads, do not allow heavy equipment on the completed base course except when necessary for construction. When it is necessary for heavy equipment to travel on the completed base course, protect the area against marring or damage to the completed work.

3.13 MAINTENANCE

Maintain the base course in a satisfactory condition until the full pavement section is completed and accepted. Immediately repair any defects and repeat repairs as often as necessary to keep the area intact. Retest any base course that was not paved over prior to the onset of winter to verify that it still complies with the requirements of this specification. Rework or replace any area of base course that is damaged as necessary to comply with this specification.

3.14 DISPOSAL OF UNSATISFACTORY MATERIALS

Dispose of any unsuitable materials that have been removed as directed . No additional payments will be made for materials that have to be replaced.

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# SECTION 32 12 13

# BITUMINOUS TACK AND PRIME COATS
**05/17**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS K 2208 | (2009) Asphalt Emulsion |
| JIS K 2251 | (2003) Crude Petroleum and Petroleum Products - Sampling |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Sampling and Testing; G

### 1.3 QUALITY ASSURANCE

Certificates of compliance for asphalt materials delivered will be obtained and checked to ensure that specification requirements are met. Tack coat materials will not be diluted. Prime coat materials when emulsions are used can be diluted on site with potable water up to 1 part emulsion to 1 part water.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Inspect the materials delivered to the site for contamination and damage. Unload and store the materials with a minimum of handling.

### 1.5 EQUIPMENT, TOOLS AND MACHINES

#### 1.5.1 General Requirements

Equipment, tools and machines used in the work are subject to approval. Maintain in a satisfactory working condition at all times. Calibrate equipment such as asphalt distributors, scales, batching equipment, spreaders and similar equipment within 12 months of their use. If the calibration expires during project, recalibrate the equipment before work

can continue.

### 1.5.2 Bituminous Distributor

Provide a self propelled distributor with pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the surface being sprayed. Design and equip the distributor to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled total liquid rates from 0.14 to 4.5 L/square meter, with a pressure range of 172.4 to 517.1 kPa and with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor will be capable of circulating and agitating the bituminous material during the heating process.

### 1.5.3 Heating Equipment for Storage Tanks

Use steam, electric, or hot oil heaters for heating the bituminous material. Provide steam heaters consisting of steam coils and equipment for producing steam, so designed that the steam cannot come in contact with the bituminous material. Fix an armored thermometer to the tank with a temperature range from 4.4 to 204.4 degrees C so that the temperature of the bituminous material may be determined at all times.

### 1.5.4 Power Brooms and Power Blowers

Use power brooms and power blowers suitable for cleaning the surfaces to which the bituminous coat is to be applied.

## 1.6 ENVIRONMENTAL REQUIREMENTS

Apply bituminous coat only when the surface to receive the bituminous coat is dry. A limited amount of moisture (approximately 0.14 liter/square meter) can be sprayed on the surface of unbound material when prime coat is used to improve coverage and penetration of asphalt material. Apply bituminous coat only when the atmospheric temperature in the shade is 10 degrees C or above and when the temperature has not been below 2 degrees C for the 12 hours prior to application, unless otherwise directed.

# PART 2 PRODUCTS

## 2.1 PRIME COAT

### 2.1.1 Emulsified Asphalt

Provide emulsified asphalt conforming to JIS K 2208, Type PK-3. . Asphalt emulsion can be diluted up to 1 part water to 1 part emulsion for prime coat use. Do not dilute asphalt emulsion for tack coat use.

## 2.2 TACK COAT

### 2.2.1 Emulsified Asphalt

Provide emulsified asphalt conforming to JIS K 2208, Type PK-4. For prime coats the emulsified asphalt can be diluted with up to 1 part emulsion to 1 part water. No dilution is allowed for tack coat applications.

# PART 3 EXECUTION

## 3.1 PREPARATION OF SURFACE

Immediately before applying the bituminous coat, remove all loose material, dirt, clay, or other objectionable material from the surface to be treated by means of a power broom or blower supplemented with hand brooms. Apply treatment only when the surface is dry and clean.

## 3.2 APPLICATION RATE

The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

### 3.2.1 Tack Coat

Apply bituminous material for the tack coat in quantities of not less than 0.30 L nor more than 0.60 L/square meter of residual asphalt onto the pavement surface as approved by the Contracting Officer. Do not dilute asphalt emulsion when used as a tack coat.

### 3.2.2 Prime Coat

Apply bituminous material for the prime coat in quantities of not less than 1.0 L nor more than 2.0 L/square meter of residual asphalt for asphalt emulsion up to a 1 to 1 dilution rate or for residual asphalt for cutback asphalt.

## 3.3 APPLICATION TEMPERATURE

### 3.3.1 Viscosity Relationship

Apply asphalt at a temperature that will provide a viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 square mm/sec, kinematic. Furnish the temperature viscosity relation to the Contracting Officer.

### 3.3.2 Temperature Ranges

The viscosity requirements determine the application temperature to be used. The following is a normal range of application temperatures:

| Asphalt Emulsion | |
|---|---|
| All Grades | 20-70 degrees C |

## 3.4 APPLICATION

### 3.4.1 General

Following preparation and subsequent inspection of the surface, apply the bituminous prime or tack coat with the bituminous distributor at the specified rate with uniform distribution over the surface to be treated. Properly treat all areas and spots, not capable of being sprayed with the distributor, with the hand spray. Until the succeeding layer of pavement is placed, maintain the surface by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, spread clean dry sand to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment are permitted within 8 meters of heating, distributing, and transferring operations of cutback materials. Prevent all traffic, except for paving equipment used in constructing the surfacing, from using the underlying material, whether primed or not, until the surfacing is completed. The bituminous coat requirements are described herein.

### 3.4.2 Prime Coat

The prime coat is required if it will be at least 7 days before the asphalt mixture is constructed on the underlying (base course, etc.) compacted material. The type of liquid asphalt and application rate will be as specified herein. Protect the underlying layer from any damage (water, traffic, etc.) until the surfacing is placed. If the Contractor places the surfacing within seven days, the choice of protection measures or actions to be taken is at the Contractor's option. Repair (recompact or replace) damage to the underlying material caused by lack of, or inadequate, protection by approved methods at no additional cost to the Government. If the Contractor opts to use the prime coat, apply as soon as possible after consolidation of the underlying material. Apply the bituminous material uniformly over the surface to be treated at a pressure range of 172.4 to 517.1 kPa; the rate will be as specified above in paragraph APPLICATION RATE. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, spread building paper on the surface for a sufficient distance back from the ends of each application to start and stop the prime coat on the paper and to ensure that all sprayers will operate at full force on the surface to be treated. Immediately after application remove and destroy the building paper.

### 3.4.3 Tack Coat

A tack coat should be applied to every bound surface (asphalt or concrete pavement) that is being overlaid with asphalt mixture and at transverse and longitudinal joints. Apply the tack coat when the surface to be treated is clean and dry. Immediately following the preparation of the surface for treatment, apply the bituminous material by means of the bituminous distributor, within the limits of temperature specified herein and at a rate as specified above in paragraph APPLICATION RATE. Apply the bituminous material so that uniform distribution is obtained over the entire surface to be treated. Treat lightly coated areas and spots missed by the distributor by spraying with a hand wand or using other approved method. Following the application of bituminous material, allow the surface to cure without being disturbed for period of time necessary to permit setting of the tack coat. Apply the bituminous tack coat only as far in advance of the placing of the overlying layer as required for that

day's operation. Maintain and protect the treated surface from damage until the succeeding course of pavement is placed.

## 3.5 CURING PERIOD

Following application of the bituminous material and prior to application of the succeeding layer of asphalt mixture allow the bituminous coat to cure and water or volatiles to evaporate prior to overlaying. Maintain the tacked surface in good condition until the succeeding layer of pavement is placed, by protecting the surface against damage and by repairing and recoating deficient areas. Allow the prime coat to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course. Furnish and spread enough sand to effectively blot up excess bituminous material.

## 3.6 FIELD QUALITY CONTROL

Obtain certificates of compliance for all asphalt material delivered to the project. Obtain samples of the bituminous material under the supervision of the Contracting Officer. The sample may be retained and tested by the Government at no cost to the Contractor.

## 3.7 SAMPLING AND TESTING

Furnish certified copies of the manufacturer's test reports indicating temperature viscosity relationship for cutback asphalt or asphalt cement, compliance with applicable specified requirements, not less than 5 days before the material is required in the work.

### 3.7.1 Sampling

Unless otherwise specified, sample bituminous material in accordance with JIS K 2251.

### 3.7.2 Calibration Test

Furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibrate using the approved job material and prior to applying the bituminous coat material to the prepared surface.

### 3.7.3 Trial Applications

Before applying the spray application of tack or prime coat, apply three lengths of at least 30 meters for the full width of the distributor bar to evaluate the amount of bituminous material that can be satisfactorily applied.

#### 3.7.3.1 Tack Coat Trial Application Rate

Unless otherwise authorized, apply the trial application rate of bituminous tack coat materials in the amount of 0.23 L/square meter. Make other trial applications using various amounts of material as may be deemed necessary.

#### 3.7.3.2 Prime Coat Trial Application Rate

Unless otherwise authorized, apply the trial application rate of bituminous materials in the amount of 0.66 L/square meter. Make other trial applications using various amounts of material as may be deemed

necessary.

### 3.7.4 Sampling and Testing During Construction

Perform quality control sampling and testing as required in paragraph FIELD QUALITY CONTROL.

## 3.8 TRAFFIC CONTROLS

Keep traffic off surfaces freshly treated with bituminous material. Provide sufficient warning signs and barricades so that traffic will not travel over freshly treated surfaces.

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**08/09**

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# HOT-MIX ASPHALT (HMA) FOR ROADS
**08/09**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1110 | (2006) Methods of Test for Density and Water Absorption of Coarse Aggregates |
| JIS A 1121 | (2007) Method of Test for Resistance to Abrasion of Coarse Aggregate by Use of the Los Angeles Machine |
| JIS A 1122 | (2014) Method of Test for Soundness of Aggregate by Use of Sodium Sulfate |
| JIS A 1137 | (2014) Method of Test for Clay Lumps Contained in Aggregates |
| JIS A 5001 | (2008) Crushed Stone for Road Construction |
| JIS A 5008 | (2008) Limestone Filler for Bituminous Paving Mixtures |
| JIS K 2207 | (2006) Petroleum Asphalts |

JAPAN ROAD ASSOCIATION (JRA)

| | |
|---|---|
| JRA HAP | (2019) Handbook for Asphalt Pavement |

### 1.2 GENERAL REQUIREMENTS

All materials, equipment, and construction procedures of hot-mix asphalt pavement for this project shall be in accordance with the Japan Road Association standards per publication identified in this specification.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mix Design; G

Quality Control; G

Material Acceptance; G

SD-06 Test Reports

Aggregates; G

QC Monitoring; G

## 1.4 ENVIRONMENTAL REQUIREMENTS

Do not place the hot-mix asphalt upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 3. The temperature requirements may be waived by the Contracting Officer, if requested; however, meet all other requirements, including compaction.

Table 3. Surface Temperature Limitations of Underlying Course

| Mat Thickness, mm | Degrees C |
|---|---|
| 75 or greater | 4 |
| Less than 75 | 7 |

# PART 2 PRODUCTS

## 2.1 SYSTEM DESCRIPTION

Perform the work consisting of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. HMA designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections indicated. Construct each course to the depth, section, or elevation required by the drawings and roll, finish, and approve it before the placement of the next course.

## 2.2 AGGREGATES

Provide aggregates consisting of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the 5 mm sieve is coarse aggregate. The portion of material passing the 5 mm sieve and retained on the 0.074 mm sieve is fine aggregate. The portion passing the 0.074 mm sieve is defined as mineral filler. Submit all aggregate test results and samples to the Contracting Officer at least 14 days prior to start of construction.

### 2.2.1 Coarse Aggregate

Provide coarse aggregate consisting of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances and conforming to JIS A 5001. All individual coarse aggregate sources shall meet the following requirements:

Percent Passing (by Weight)

| Sieve Size (mm) | S-20 (20-13 mm) | S-13 (13-5 mm) | S-5 (5-2.5 mm) |
|---|---|---|---|
| 25 | 100 | - | - |
| 20 | 85 - 100 | 100 | - |
| 13 | 0 - 15 | 85 - 100 | 100 |
| 5 | - | 0 - 15 | 85 - 100 |
| 2.5 | - | - | 0 - 25 |

a. At least 75 percent by weight of the aggregate shall have two or more fractured faces in accordance with JRA HAP

b. It shall be of uniform quality, clean, hard and durable, and shall not contain deleterious substances over the maximum percent by weight, such as clay or loam (0.25% maximum), soft stone pieces (5.0% maximum), and flat or elongated stone pieces (10.0% maximum) in accordance with JRA HAP.

c. Specific gravity shall be 2.45 or more when tested with JIS A 1110, water absorption shall be 3.0 percent or less when tested with JIS A 1110, and wear shall be not more than 30 percent when tested with JIS A 1121.

d. Soundness of aggregate shall be not more than 12 percent when tested with JIS A 1122.

### 2.2.2 Fine Aggregate

Fine aggregate shall consist of natural or manufactured sand, and screenings conforming to JIS A 5001, except as modified herein. Fine aggregate shall meet requirements for wear and soundness specified for coarse aggregate. Since screenings may contain deleterious substances, such as silt and clay, it is necessary to perform sufficient examination before use. Clay lumps content shall be less than 0.25% when tested with JIS A 1137. Gradation of fine aggregate shall be as follows:

| Sieve Size (mm) | Percent Passing (by Weight) |
|---|---|
| 5 | 100 |
| 2.5 | 85 - 100 |
| 0.6 | 25 - 55 |
| 0.3 | 15 - 40 |
| 0.15 | 7 - 28 |

| Sieve Size (mm) | Percent Passing (by Weight) |
|---|---|
| 0.074 | 0 - 20 |

### 2.2.3 Mineral Filler

Mineral filler shall be pulverized limestone or igneous rock that is sufficiently dry and free of lumps and meeting the requirements of JIS A 5008. Moisture content shall be less than 1.0 percent, and specific gravity shall be more than 2.60 percent. Gradation of mineral filler shall be as follows:

| Sieve Size (mm) | Percent Passing (by Weight) |
|---|---|
| 0.6 | 100 |
| 0.15 | Over 90 |
| 0.074 | Over 70 |

### 2.2.4 Composition of Hot-Mix Asphalt Mixture

#### 2.2.4.1 Aggregate Gradation

The combined aggregate gradation shall conform to gradations specified in Table 1 and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine.

Table 1

Total Percent Passing (By Weight)

| Sieve Size (mm) | Binder Course (Max. 20 mm) | Wearing Course (Max. 20 mm) | Wearing Course (Max. 13 mm) |
|---|---|---|---|
| 25 | 100 | 100 | - |
| 20 | 95 - 100 | 95 - 100 | 100 |
| 13 | 70 - 90 | 75 - 90 | 95 - 100 |
| 5 | 35 - 55 | 45 - 65 | 55 -70 |
| 2.5 | 20 - 35 | 35 - 50 | 35 -50 |
| 0.6 | 11 - 23 | 18 - 30 | 18 - 30 |

| Sieve Size (mm) | Binder Course (Max. 20 mm) | Wearing Course (Max. 20 mm) | Wearing Course (Max. 13 mm) |
|---|---|---|---|
| 0.3 | 5 - 16 | 10 - 21 | 10 - 21 |
| 0.15 | 4 - 12 | 6 - 16 | 6 - 16 |
| 0.074 | 2 - 7 | 4 - 8 | 4 - 8 |

2.2.4.2 Quantity of Asphalt Cement

Mix asphalt cement with aggregates of corresponding mixes in the following proportions:

| Asphalt Cement Percent by Weight of Total Mix | |
|---|---|
| Binder Course | Wearing Course |
| 4.5 - 6 | 5 - 7 |

## 2.3 ASPHALT CEMENT

Asphalt cement shall conform to JIS K 2207, penetration grade 40-60 (high traffic areas), 60-80 (general traffic conditions), 80-100 (snowy regions), and 100-120 (extremely cold places).

## 2.4 MIX DESIGN

a. Develop the mix design. The asphalt mix shall be composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt material. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF). Submit proposed JMF; do not produce hot-mix asphalt for payment until a JMF has been approved. The hot-mix asphalt shall be designed in accordance with Chapter 5 of the JRA HAP - Handbook for Asphalt Pavement and the criteria shown in Table 2.

### 2.4.1 JMF Requirements

Submit in writing the job mix formula for approval at least 14 days prior to the start of the test section including as a minimum:

a. Source and proportions, percent by weight, of each ingredient of the mixture.

b. Correct gradation, the percentages passing each size sieve listed in the specification for the mixture to be used, for the aggregate and mineral filler from each separate source and from each different size to be used in the mixture and for the composite mixture.

c. Amount of material passing the JIS 0.074 mm sieve as determined by dry sieving.

d. Number of blows of hammer compaction per side of molded specimen.

e. Temperature viscosity relationship of the asphalt pavement.

f. Stability, flow, percent voids in mineral aggregate, percent air voids, and unit weight.

g. Asphalt absorption by the aggregate.

h. Effective asphalt content as percent by weight of total mix.

i. Temperature of the mixture immediately upon completion of mixing.

j. Asphalt viscosity grade and/or penetration range.

k. Curves for the binder and wearing courses.

#### 2.4.1.1 Marshall Test

Marshall test specimen of hot-mix asphalt mixture shall be prepared in a laboratory to determine the optimum composition of aggregates and the optimum quantity of asphalt cement. Aggregate gradation and asphalt cement content used in the mixtures shall be within the limits specified. Standard value for Marshall test shall be as follows:

Table 2. Mix Design Criteria

| Type of Mixture | Binder Course | Wearing Course |
|---|---|---|
| Number of Blows (Traffic Classification C or heavier) | 75 | 75 |
| Number of Blows (Traffic Classification B or ligher) | 50 | 50 |
| Percentage of Air Voids (%) | 3-7 | 3-6 |
| Voids Filled with Asphalt (%) | 65-85 | 70-85 |
| Marshall Stability (kgf) | 500 or more | 750 or more |
| Flow Value (1/100cm) | 20-40 | 20-40 |

### 2.4.2 Adjustments to Field JMF

Keep the Laboratory JMF for each mixture in effect until a new formula is approved in writing by the Contracting Officer. Should a change in sources of any materials be made, perform a new laboratory jmf design and a new JMF approved before the new material is used. The Contractor will be allowed to adjust the Laboratory JMF within the limits specified below

to optimize mix volumetric properties with the approval of the Contracting Officer. Adjustments to the Laboratory JMF shall be applied to the field (plant) established JMF and limited to those values as shown. Adjustments shall be targeted to produce or nearly produce 4 percent voids total mix (VTM).

| TABLE 3. Field (Plant) Established JMF Tolerances | |
|---|---|
| Sieves, mm | Adjustments (plus or minus), percent |
| 13 | 3 |
| 5 | 3 |
| 2.5 | 3 |
| 0.074 | 1 |
| Binder Content | 0.4 |

If adjustments are needed that exceed these limits, develop a new mix design. Tolerances given above may permit the aggregate grading to be outside the limits shown in Table 1; while not desirable, this is acceptable, except for the 0.074 mm sieve, which shall remain within the aggregate grading of Table 1.

## 2.5 RECYCLED HOT MIX ASPHALT

Recycled HMA shall consist of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt cement to produce a consistent gradation and asphalt content and properties. When RAP is fed into the plant, the maximum RAP chunk size shall not exceed 50 mm. The amount of RAP shall not exceed 30 percent.

# PART 3 EXECUTION

## 3.1 PREPARATION OF ASPHALT BINDER MATERIAL

Heat the asphalt cement material avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 160 degrees C when added to the aggregates.

## 3.2 PREPARATION OF MINERAL AGGREGATE

Heat and dry the aggregate for the mixture prior to mixing. No damage shall occur to the aggregates due to the maximum temperature and rate of heating used. The temperature of the aggregate and mineral filler shall not exceed 175 degrees C when the asphalt cement is added. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

## 3.3 PREPARATION OF HOT-MIX ASPHALT MIXTURE

Accurately weigh or gauge the aggregates and the dry mineral filler and convey into the mixer in the proportionate amounts of each aggregate size

required to meet the job-mix formula. Introduce required amount of asphalt into the mixer at a temperature at which it can be applied uniformly to the aggregate but not to exceed 163 degrees C. In batch mixing, after the aggregates and mineral filler have been introduced into the mixer and mixed for not less than 15 seconds, add asphalt by spraying or other approved methods, and continue mixing for a period of not less than 20 seconds or as much longer as may be required to obtain a homogeneous mixture. The time required to add or spray the asphalt into the mixer will not be added to the total wet-mixing time provided this operation does not exceed 10 seconds and a homogeneous mixture is obtained. The additional mixing time, when required, will be as directed. The temperature of the mixture at the time of discharge shall not exceed 168 degrees C. The temperature of the aggregate and mineral filler in the mixer shall not exceed 177 degrees C when the asphalt is added. When the mixture is prepared in a twin-pugmill mixer, the volume of the aggregates, mineral filler, and asphalt shall not extend above the tips of the mixer blades when the blades are in a vertical position. Overheated and carbonized mixtures, or mixtures that foam or show indication of free moisture, will be rejected. When free moisture is detected in batch mix plant produced mixture, withdraw the aggregates in the hot bins immediately and return to the respective stockpiles.

## 3.4 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing the hot mix asphalt, clean the underlying course of dust and debris. Apply a prime coat and/or tack coat in accordance with the contract specifications.

### 3.4.1 Raising of Existing Manhole, Handhole, Valve Box and Catch Basin

If there are existing manhole, handhole, valve box and catch basins in existing asphalt concrete pavement to be overlaid, those shall be raised up to flush with the finished surface of new hot-mix asphalt pavement before new asphalt concrete is placed. Existing mortar leveling course under the manhole, handhole and valve box shall be replaced with new up to new level to provide a flush setting.

## 3.5 TESTING LABORATORY

Submit laboratory certification issued by the local prefectural or central government (Japan Ministry of Land, Infrastructure, Transport and Tourism (MLIT)). Use a laboratory to develop the JMF. The Government will inspect the laboratory equipment and test procedures prior to the start of hot mix operations. The laboratory shall maintain a valid certification for the duration of the project. A statement signed by the manager of the laboratory stating that it meets these requirements or clearly listing all deficiencies shall be submitted to the Contracting Officer prior to the start of construction. The statement shall contain as a minimum:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

## 3.6 TRANSPORTING AND PLACING

### 3.6.1 Transporting

Transport the hot-mix asphalt from the mixing plant to the site in clean, tight vehicles. Schedule deliveries so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Provide adequate artificial lighting for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 60 degrees C. To deliver mix to the paver, use a material transfer vehicle operated to produce continuous forward motion of the paver.

### 3.6.2 Placing

Place and compact the mix at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Upon arrival, place the mixture to the full width by an asphalt paver; it shall be struck off in a uniform layer of such depth that, when the work is completed, it will have the required thickness and conform to the grade and contour indicated. Regulate the speed of the paver to eliminate pulling and tearing of the asphalt mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. Place the mixture in consecutive adjacent strips having a minimum width of 3 m. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 300 mm; however, the joint in the surface course shall be at the centerline of the pavement. Transverse joints in one course shall be offset by at least 3 m from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 3 m. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

## 3.7 COMPACTION OF MIXTURE

After placing, the mixture shall be thoroughly and uniformly compacted by rolling. Compact the surface as soon as possible without causing displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once. Furnish sufficient rollers to handle the output of the plant. Continue rolling until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, keep the wheels properly moistened but excessive water will not be permitted. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective shall be removed full depth, replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching will not be allowed.

## 3.8 JOINTS

The formation of joints shall be performed ensuring a continuous bond

between the courses and to obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

### 3.8.1 Transverse Joints

Do not pass the roller over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint. Remove the cutback material from the project. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.

### 3.8.2 Longitudinal Joints

Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 80 degrees C at the time of placing adjacent lanes), or otherwise defective, shall be cut back a maximum of 75 mm from the top of the course with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course. All cutback material shall be removed from the project. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

## 3.9 Finishing at Edge and Limit of Paving

Overlay of new hot-mix asphalt mixture shall be finished evenly in the same thickness indicated. Overlay shall be finished in gentle slope so that the edge of new overlaying pavement shall meet the edge elevation of existing asphalt concrete pavement. And where the drawing indicates "Limit of Paving," overlay shall be finished to provide a smooth transition to existing concrete pavement.

## 3.10 Compacted Earth Shoulder

Place and compact earth at edges of course for at least 30 cm of the shoulder.

## 3.11 QUALITY CONTROL

### 3.11.1 General Quality Control Requirements

Develop and submit an approved Quality Control Plan. Submit aggregate and QC test results. Do not produce hot-mix asphalt for payment until the quality control plan has been approved addressing all elements which affect the quality of the pavement including, but not limited to:

a. Mix Design

b. Aggregate Grading

c. Quality of Materials

d. Stockpile Management

e. Proportioning

f. Mixing and Transportation

g. Mixture Volumetrics

h. Moisture Content of Mixtures

i. Placing and Finishing

j. Joints

k. Compaction

l. Surface Smoothness

3.11.2 Testing Laboratory

Provide a fully equipped asphalt laboratory located at the plant or job site. Laboratory facilities shall be kept clean and all equipment maintained in proper working condition. The Contracting Officer shall be permitted unrestricted access to inspect the Contractor's laboratory facility, to witness quality control activities, and to perform any check testing desired. The Contracting Officer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are corrected.

3.11.3 Quality Control Testing

Perform all quality control tests applicable to these specifications in accordance with the testing criteria and frequency requirements as set forth in Chapter 6 of the JRA HAP - Handbook for Asphalt Pavement. Develop a Quality Control Testing Plan as part of a Quality Control Program. The testing program shall include, but shall not be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability (, flow , in-place density, grade and smoothness.

3.11.3.1 Additional Testing

Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.

3.11.3.2 QC Monitoring

Submit all QC test results to the Contracting Officer on a daily basis as the tests are performed. The Contracting Officer reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

3.11.4 Sampling

When directed by the Contracting Officer, sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies

corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

## 3.12 MATERIAL ACCEPTANCE

### 3.12.1 Grade

The final wearing surface of pavement shall conform to the elevations and cross sections shown and shall vary not more than 15 mm from the plan grade established and approved at site of work. Finished surfaces at juncture with other pavements shall coincide with finished surfaces of abutting pavements. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved. The grade will be determined by running lines of levels at intervals of 7.6 m, or less, longitudinally and transversely, to determine the elevation of the completed pavement surface. Within 5 working days, after the completion of a particular lot incorporating the final wearing surface, test the final wearing surface of the pavement for conformance with the specified plan grade. Diamond grinding may be used to remove high spots to meet grade requirements. Skin patching for correcting low areas or planing or milling for correcting high areas will not be permitted.

### 3.12.2 Surface Smoothness

Perform all testing in the presence of the Contracting Officer. Keep detailed notes of the results of the testing and furnish a copy to the Government immediately after each day's testing. Use the profilograph method for all longitudinal testing, except where the runs would be less than 60 m in length and the ends where the straightedge will be used.

#### 3.12.2.1 Smoothness Requirements

##### 3.12.2.1.1 Straightedge Testing

The finished surfaces of the pavements shall have no abrupt change of 6 mm or more, and all pavements shall be within the tolerances of 6 mm in both the longitudinal and transverse directions, when tested with an approved 3 m straightedge.

##### 3.12.2.1.2 Profilograph Testing

The finished surfaces of the pavements shall have no abrupt change of 3 mm or more, and each 0.1 km segment of each pavement lot shall have a Profile Index not greater than 140 mm/km when tested with an approved Japanese construction practice using profilometer. If the extent of the pavement in either direction is less than 60 m, that direction shall be tested by the straightedge method and shall meet requirements specified above.

#### 3.12.2.2 Testing Method

After the final rolling, but not later than 24 hours after placement, test the surface of the pavement in each entire lot in such a manner as to reveal all surface irregularities exceeding the tolerances specified above. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas shall be retested immediately after grinding. Test each lot of the pavement in both a longitudinal and a transverse direction on parallel lines. Set the transverse lines 4.5 m or

less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane for lanes less than 6.1 m wide and at the third points for lanes 6.1 m or wider. Also test other areas having obvious deviations. Longitudinal testing lines shall be continuous across all joints.

3.12.2.2.1 Straightedge Testing

Hold the straightedge in contact with the surface and move it ahead one-half the length of the straightedge for each successive measurement. Determine the amount of surface irregularity by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points.

3.12.2.2.2 Profilograph Testing

Perform profilograph testing using approved equipment and procedures. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must-grind" bumps and the Profile Index for each 0.1 km segment of each pavement lot. Grade breaks on parking lots shall be accommodated by breaking the profile segment into shorter sections and repositioning the blanking band on each segment. The "blanking band" shall be 5 mm wide and the "bump template" shall span 25 mm with an offset of 7.5 mm. Compute the Profile Index for each pass of the profilograph in each 0.1 km segment. The Profile Index for each segment shall be the average of the Profile Indices for each pass in each segment. Furnish a copy of the reduced tapes to the Government at the end of each day's testing.

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# SECTION 32 15 00

# AGGREGATE SURFACING
**05/17**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1102 | (2014) Method of Test for Sieve Analysis of Aggregates |
| JIS A 1103 | (2014) Method of Test for Amount of Material Passing Test Sieve 75 µm in Aggregates |
| JIS A 1201 | (2009) Practise for Preparing Disturbed Soil Samples for Soil Testing |
| JIS A 1210 | (2009) Test Method for Soil Compaction Using a Rammer |
| JIS A 1214 | (2013) Test Method for Soil Density by the Sand Replacement Method |
| JIS A 5001 | (2008) Crushed Stone for Road Construction |
| JIS Z 8801 | (2006) Test Sieves Part 1: Test Sieves of Metal Wire Cloth |

### 1.2 DEGREE OF COMPACTION

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in JIS A 1210 abbreviated as a percent of laboratory maximum dry density.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G

SD-06 Test Reports

Initial Tests; G
In-Place Tests; G

## 1.4 EQUIPMENT, TOOLS, AND MACHINES

All plant, equipment, and tools used in the performance of the work will be subject to approval by the Contracting Officer before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Provide adequate equipment having the capability of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

## 1.5 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements and perform testing at the specified frequency. The Contracting Officer may specify the time and location of the tests. Furnish copies of test results to the Contracting Officer within 24 hours of completion of the tests.

### 1.5.1 Sampling

Take samples for laboratory testing in conformance with JIS A 1201. When deemed necessary, the sampling will be observed by the Contracting Officer.

### 1.5.2 Testing

#### 1.5.2.1 Sieve Analysis

Perform sieve analysis in conformance with JIS A 1103 and JIS A 1102 using sieves conforming to JIS Z 8801.

#### 1.5.2.2 Field Density Tests

Measure field density in accordance with JIS A 1214.

## 1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 2 degrees C. It is the responsibility of the Contractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by the Contracting Officer. Bring surfaces damaged by freeze, rainfall, or other weather conditions to a satisfactory condition.

# PART 2 PRODUCTS

## 2.1 AGGREGATES

Provide aggregates consisting of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Provide aggregates free from lumps and balls of clay, organic matter,

objectionable coatings, and other foreign materials. The Contractor is responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction and proof rolling operations have been completed. Aggregates shall conform to JIS A 5001, single-sized stone S-20.

### 2.1.1 Gradation Requirements

Gradation requirements specified in TABLE I apply to the completed aggregate surface. It is the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. TABLE I shows permissible gradings for granular material used in aggregate surface roads and airfields. Use sieves conforming to JIS Z 8801.

GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

| Sieve Designation | S-20 |
|---|---|
| 25.0 | 100 |
| 20.0 | 85-100 |
| 13.0 | 0-15 |

## 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.2.1 Initial Tests

Perform one test on the proposed material prior to commencing construction, to demonstrate that the proposed material meets all specified requirements when furnished.

a. Sieve Analysis.

Submit certified copies of test results for approval not less than 30 days before material is required for the work.

# PART 3 EXECUTION

## 3.1 PREPARATION OF SUBGRADE

Clean the subgrade of all foreign substances. Correct ruts or soft yielding spots in the subgrade, areas having inadequate compaction and deviations of the surface from the requirements set forth herein by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade and recompacting to density requirements specified in Section 31 00 00 EARTHWORK Section.

## 3.2 GRADE CONTROL

During construction, maintain the lines and grades including cross slope indicated for the aggregate surface course by means of line and grade stakes placed.

## 3.3 MIXING AND PLACING MATERIALS

Mix and place the materials to obtain uniformity of the material and a uniform optimum water content for compaction. Make adjustments in mixing, placing procedures, or in equipment to obtain the true grades, to minimize segregation and degradation, to obtain the desired water content, and to ensure a satisfactory surface course.

## 3.4 LAYER THICKNESS

Place the aggregate material on the subgrade in layers of uniform thickness. Compact the completed aggregate surface course to the thickness indicated. No individual layer may be thicker than 150 mm nor be thinner than 75 mm in compacted thickness.

## 3.5 COMPACTION

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in JIS A 1210 abbreviated herein as percent laboratory maximum density. Compact each layer of the aggregate surface course with approved compaction equipment. Compact the mixture with mechanical tampers. Continue compaction until each layer through the full depth is compacted to at least 100 percent of laboratory maximum density. Remove any materials that are found to be unsatisfactory and replace them with satisfactory material or rework them to produce a satisfactory material.

## 3.6 SMOOTHNESS TEST

Construct each layer so that the surface shows no deviations in excess of 10 mm when tested with a 3 m straightedge applied both parallel with and at right angles to the centerline of the area to be paved. Correct deviations exceeding this amount by removing material, replacing with new material, or reworking existing material and compacting, as directed.

## 3.7 FIELD QUALITY CONTROL

### 3.7.1 In-Place Tests

Perform each of the following tests on samples taken from the placed and compacted aggregate surface course. Take samples and test at the rates indicated.

a. Perform one density test.

b. Measure the thickness of the aggregate surface course.

## 3.8 MAINTENANCE

Maintain the aggregate surface course in a condition that will meet all specification requirements until accepted.

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# CONCRETE CURBS, GUTTERS, PAVEMENT STOPPER, AND SIDEWALKS
**05/18**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

| | |
|---|---|
| ASTM C309 | (2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete |
| ASTM D1751 | (2018) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 1101 | (2020) Method of Test for Slump of Concrete |
| JIS A 1115 | (2020) Method of Sampling Fresh Concrete |
| JIS A 1118 | (2017) Method of Test for Air Content of Fresh Concrete by Volumetric Method |
| JIS A 1128 | (2020) Method of Test for Air Content of Fresh Concrete by Pressure Method |
| JIS A 1132 | (2020) Method of Making and Curing Concrete Specimens |
| JIS A 5001 | (2008) Crushed Stone for Road Construction |
| JIS A 5308 | (2019) Ready-Mixed Concrete |
| JIS A 5371 | (2010) Precast Unreinforced Concrete Product |
| JIS A 5758 | (2016) Sealants for Sealing and Glazing in Buildings |
| JIS G 3551 | (2021) Welded Wire Mesh and Rebar Grid |
| JIS K 6781 | (1994) Polyethylene Films for Agriculture |
| JIS P 3401 | (2000) Kraft Paper |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Concrete; G

Precast Concrete Curb; G

Precast Concrete Pavement Stopper; G

Reinforcing Steel; G

Expansion Joint Filler; G

Joint Sealant; G

Underlay Paper; G

Gravel Base Course; G

SD-06 Test Reports

Field Quality Control; G

## 1.3 EQUIPMENT, TOOLS, AND MACHINES

### 1.3.1 General Requirements

Plant, equipment, machines, and tools used in the work will be subject to approval and must be maintained in a satisfactory working condition at all times. Use equipment capable of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Discontinue using equipment that produces unsatisfactory results. Allow the Contracting Officer access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

## 1.4 ENVIRONMENTAL REQUIREMENTS

### 1.4.1 Placing During Cold Weather

Do not place concrete when the air temperature reaches 5 degrees C and is falling, or is already below that point. Placement may begin when the air temperature reaches 2 degrees C and is rising, or is already above 5 degrees C. Make provisions to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 2 degrees C, placement and protection must be approved in writing. Approval will be contingent upon full conformance with the following provisions. Prepare and protect the underlying material so that it is entirely free of frost when the concrete is deposited. Heat mixing water and aggregates as necessary to result in the temperature of the in-place concrete being

between 10 and 30 degrees C. Methods and equipment for heating must be approved. Provide covering or other means as needed to maintain the concrete at a temperature of at least 10 degrees C for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

### 1.4.2 Placing During Warm Weather

The temperature of the concrete as placed must not exceed 30 degrees C except where an approved retarder is used. Cool the mixing water and aggregates as necessary to maintain a satisfactory placing temperature. The placing temperature must not exceed 35 degrees C at any time.

## PART 2 PRODUCTS

### 2.1 CONCRETE

Provide concrete conforming to the applicable requirements as specified in this section and JIS A 5308 except as otherwise specified. Concrete must have a minimum compressive strength of 24 MPa at 28 days for sidewalks and gutters. Other concrete products shall be as described in other paragraphs in this section and as indicated on drawings. Size of aggregate must not exceed 37.5 mm. Submit copies of certified delivery tickets for all concrete used in the construction.

### 2.1.1 Air Content

Use concrete mixtures that have an air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

### 2.1.2 Slump

Use concrete with a slump of 75 mm plus or minus 25 mm for hand placed concrete or 25 mm plus or minus 10 mm for slipformed concrete as determined in accordance with JIS A 1101.

### 2.2 CONCRETE CURING MATERIALS

### 2.2.1 Impervious Sheet Materials

Use impervious sheet materials conforming to JIS K 6781, type optional, except that polyethylene film, if used, must be white opaque.

### 2.2.2 White Pigmented Membrane-Forming Curing Compound

Use white pigmented membrane-forming curing compound meeting Japanese standards and conforming to ASTM C309, Type 2.

### 2.3 CONCRETE PROTECTION MATERIALS

Use concrete protection materials consisting of a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

## 2.4 JOINT FILLER STRIPS

### 2.4.1 Expansion Joint Filler, Premolded

Unless otherwise indicated, use 10 mm thick premolded expansion joint filler meeting Japanese standards and conforming to ASTM D1751.

## 2.5 JOINT SEALANTS

Use cold-applied joint sealant meeting Japanese standards and conforming to JIS A 5758.

## 2.6 FORM WORK

Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Use wood or steel forms that are straight and of sufficient strength to resist springing during depositing and consolidating concrete.

### 2.6.1 Wood Forms

Use forms that are surfaced plank, 50 mm nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Use forms with a nominal length of 3 m. Radius bends may be formed with 19 mm boards, laminated to the required thickness.

### 2.6.2 Steel Forms

Use channel-formed sections with a flat top surface and welded braces at each end and at not less than two intermediate points. Use forms with interlocking and self-aligning ends. Provide flexible forms for radius forming, corner forms, form spreaders, and fillers as needed. Use forms with a nominal length of 3 m and that have a minimum of 3 welded stake pockets per form. Use stake pins consisting of solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

### 2.6.3 Sidewalk Forms

Use sidewalk forms that are of a height equal to the full depth of the finished sidewalk.

### 2.6.4 Curb and Gutter Forms

Use curb and gutter outside forms that have a height equal to the full depth of the curb or gutter. Use rigid forms for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 3 m or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 38 mm benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

### 2.6.5 Precast Concrete Curb or Precast Concrete Pavement Stopper

Precast concrete curb or precast concrete pavement stopper, where indicated, shall conform to JIS A 5371.

### 2.6.6 Concrete Fill Under Precast Concrete Curbs

Shall be of size and shape as indicated with a compressive strength of 18 MPa at 28 days.

### 2.6.7 Underlay Paper

Underlay sheet shall be nonabsorptive and shall resist breakage when concrete is being place and compacted. Use kraft paper conforming to JIS P 3401.

### 2.6.8 Reinforcing Steel

Welded wire fabric in accordance with JIS G 3551 shall be provided for odd-shaped slabs.

### 2.6.9 Gravel Base Course

Crushed stone for base course at sidewalks, curbs and gutters, and pavement stoppers shall be crusher run conforming to JIS A 5001, RC-40.

## PART 3 EXECUTION

## 3.1 SUBGRADE PREPARATION

Construct subgrade to the specified grade and cross section prior to concrete placement.

### 3.1.1 Sidewalk Subgrade

Place and compact the subgrade in accordance with Section 31 00 00 EARTHWORK . Test the subgrade for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

### 3.1.2 Curb and Gutter Subgrade

Place and compact the subgrade in accordance with Section 31 00 00 EARTHWORK Section 32 11 23 AGGREGATE BASE COURSES . Test the subgrade for grade and cross section by means of a template extending the full width of the curb and gutter. Use subgrade materials equal in bearing quality to the subgrade under the adjacent pavement.

### 3.1.3 Maintenance of Subgrade

Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade must be in a moist condition when concrete is placed. Prepare and protect subgrade so that it is free from frost when the concrete is deposited.

## 3.2 FORM SETTING

Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 1.2 m. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms. Remove forms in a manner that will not injure the concrete. Do not use bars or heavy tools against the concrete when removing the forms. Promptly and satisfactorily

repair concrete found to be defective after form removal. Clean forms and coat with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

### 3.2.1 Sidewalks

Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 3 mm in any 3 m long section. After forms are set, grade and alignment must be checked with a 3 m straightedge. Sidewalks must have a transverse slope of 20 mm per meter Unless otherwise indicated, construct sidewalks that are located adjacent to curbs with the low side adjacent to the curb. Do not remove side forms less than 12 hours after finishing has been completed.

### 3.2.2 Curbs and Gutters

Remove forms used along the front of the curb not less than 2 hours nor more than 6 hours after the concrete has been placed. Do not remove forms used along the back of curb until the face and top of the curb have been finished, as specified for concrete finishing. Do not remove gutter forms while the concrete is sufficiently plastic to slump in any direction.

## 3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

### 3.3.1 Formed Sidewalks

Place concrete in the forms in one layer. When consolidated and finished, the sidewalks must be of the thickness indicated. Use a strike-off guided by side forms after concrete has been placed in the forms to bring the surface to proper section to be compacted. Consolidate concrete by tamping and spading or with an approved vibrator. Finish the surface to grade with a strike off.

### 3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

### 3.3.3 Edge and Joint Finishing

Finish all slab edges, including those at formed joints, with an edger having a radius of 3 mm. Edge transverse joints before brooming. Eliminate the flat surface left by the surface face of the edger with brooming. Clean and solidly fill corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing with a properly proportioned mortar mixture and then finish.

### 3.3.4 Surface and Thickness Tolerances

Finished surfaces must not vary more than 8 mm from the testing edge of a 3 m straightedge. Permissible deficiency in section thickness will be up to 6 mm.

## 3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

### 3.4.1 Formed Curb and Gutter

Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Curve shaped gutters must be finished with a standard curb "mule".

### 3.4.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

### 3.4.3 Concrete Finishing

Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 13 mm. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter and entrance to grade with a wood float.

### 3.4.4 Joint Finishing

Finish curb edges at formed joints as indicated.

### 3.4.5 Surface and Thickness Tolerances

Finished surfaces must not vary more than 6 mm from the testing edge of a 3 m straightedge. Permissible deficiency in section thickness will be up to 6 mm.

### 3.4.6 Precast Concrete Curbs or Precast Concrete Pavement Stopper

Precast concrete curbs or precast concrete pavement stopper where used shall be installed to line and grade as indicated. Joint width shall be 10 mm. Cement mortar shall be provided to set the curbs and fill the joints. Where only precast concrete curb is used, gutter shall be constructed with cast-in-place concrete. Curbs and gutter shall be accomplished to match existing grade at transition point to existing curbs and gutters.

## 3.5 SIDEWALK JOINTS

Construct sidewalk joints to divide the surface into rectangular areas. Space transverse contraction joints at a distance equal to the sidewalk width or not to exceed 1.25 times the width, whichever is less, and continuous across the slab. Construct longitudinal contraction joints along the centerline of all sidewalks 3 m or more in width. Construct transverse expansion joints at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, install transverse expansion joints as indicated. Form expansion joints around structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

### 3.5.1 Sidewalk Contraction Joints

Form contraction joints in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness. Unless otherwise approved or indicated, either use a jointer to cut the groove or saw a groove in the hardened concrete with a power-driven saw. Construct sawed joints by sawing a groove in the concrete with a 3 mm blade. Provide an ample supply of saw blades on the jobsite before concrete placement is started. Provide at least one standby sawing unit in good working order at the jobsite at all times during the sawing operations.

### 3.5.2 Sidewalk Expansion Joints

Form expansion joints using 10 mm joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1751. Hold joint filler in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, round joint edges using an edging tool having a radius of 3 mm. Remove any concrete over the joint filler. At the end of the curing period, clean the top of expansion joints and fill with cold-applied joint sealant. Use joint sealant that is gray or stone in color. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Apply joint sealing material only when the concrete at the joint is surface dry and atmospheric and concrete temperatures are above 10 degrees C. Immediately remove any excess material on exposed surfaces of the concrete and clean the concrete surfaces.

### 3.5.3 Reinforcement Steel Placement

Accurately and securely fasten reinforcement steel in place with suitable supports and ties before the concrete is placed.

## 3.6 CURB AND GUTTER JOINTS

Construct curb and gutter joints at right angles to the line of curb and gutter.

### 3.6.1 Expansion Joints

Where curb and gutter do not abut portland cement concrete pavement, provide expansion joints at least 10 mm in width at intervals not less than 10 meters nor greater than 36 meters.

## 3.7 CURING AND PROTECTION

### 3.7.1 General Requirements

Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete must be on hand and ready for use before actual concrete placement begins. Protect concrete as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

#### 3.7.1.1 Mat Method

Cover the entire exposed surface with two or more layers of burlap. Overlap mats at least 150 mm. Thoroughly wet the mat with water prior to placing on concrete surface and keep the mat continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

#### 3.7.1.2 Impervious Sheeting Method

Wet the entire exposed surface with a fine spray of water and then cover with impervious sheeting material. Lay sheets directly on the concrete surface with the light-colored side up and overlapped 300 mm when a continuous sheet is not used. Use sheeting that is not less than 450 mm wider than the concrete surface to be cured. Secure sheeting using heavy wood planks or a bank of moist earth placed along edges and laps in the sheets. Satisfactorily repair or replace sheets that are torn or otherwise damaged during curing. Sheeting must remain on the concrete surface to be cured for not less than 7 days.

#### 3.7.1.3 Membrane Curing Method

Apply a uniform coating of white-pigmented membrane-curing compound to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Coat formed surfaces immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Do not allow concrete surface to dry before application of the membrane. If drying has occurred, moisten the surface of the concrete with a fine spray of water and apply the curing compound as soon as the free water disappears. Apply curing compound in two coats by hand-operated pressure sprayers at a coverage of approximately 5 square meters/L for the total of both coats. Apply the second coat in a direction approximately at right angles to the direction of application of the first coat. The compound must form a uniform, continuous, coherent film that will not check, crack, or peel and must be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, apply an additional coat to the affected areas within 30 minutes. Respray concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied by the method and at the coverage specified above. Respray areas where the curing compound is damaged by subsequent construction operations within the curing period. Take precautions necessary to ensure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. Tightly seal the top of the joint opening and the joint groove at exposed edges before the concrete in the region of the joint is resprayed with curing compound. Use a method used for sealing the joint groove that prevents loss of moisture from the joint during the entire specified curing period. Provide approved standby facilities for curing concrete pavement at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Adequately protect concrete surfaces to which membrane-curing compounds have been applied during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from other possible damage to the continuity of the membrane.

### 3.7.2 Backfilling

After curing, remove debris and backfill, grade, and compact the area

adjoining the concrete to conform to the surrounding area in accordance with lines and grades indicated.

### 3.7.3 Protection

Protect completed concrete from damage until accepted. Repair damaged concrete and clean concrete discolored during construction. Remove and reconstruct concrete that is damaged for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Dispose of removed material as directed.

### 3.7.4 Protective Coating

Apply a protective coating of linseed oil mixture to the exposed-to-view concrete surface after the curing period, if concrete will be exposed to de-icing chemicals within 6 weeks after placement. Moist cure concrete to receive a protective coating.

#### 3.7.4.1 Application

Complete curing and backfilling operation prior to applying two coats of protective coating. Concrete must be surface dry and clean before each application. Spray apply at a rate of not more than 11 square meters/L for first application and not more than 15.5 square meters/L for second application, except that the number of applications and coverage for each application for commercially prepared mixture must be in accordance with the manufacturer's instructions. Protect coated surfaces from vehicular and pedestrian traffic until dry.

#### 3.7.4.2 Precautions

Do not heat protective coating by direct application of flame or electrical heaters and protect the coating from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Do not apply material at ambient or material temperatures lower than 10 degrees C.

## 3.8 FIELD QUALITY CONTROL

Submit copies of all test reports within 24 hours of completion of the test.

### 3.8.1 General Requirements

Perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, take the action and submit reports as required below, and additional tests to ensure that the requirements of these specifications are met.

### 3.8.2 Concrete Testing

#### 3.8.2.1 Strength Testing

Take concrete samples in accordance with JIS A 1115 not less than once a day nor less than once for every 190 cubic meters of concrete placed. Mold cylinders in accordance with JIS A 1132 for strength testing by an approved laboratory. Each strength test result must be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of

compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 4 MPa.

#### 3.8.2.2 Air Content

Determine air content in accordance with JIS A 1118, or JIS A 1128. Use JIS A 1128 with concretes and mortars made with relatively dense natural aggregates. Make two tests for air content on randomly selected batches of each class of concrete placed during each shift. Make additional tests when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. Notify the placing forman if results are out of tolerance. The placing foreman must take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

#### 3.8.2.3 Slump Test

Perform two slump tests on randomly selected batches of each class of concrete for every 190 cubic meters, or fraction thereof, of concrete placed during each shift. Perform additional tests when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

### 3.8.3 Thickness Evaluation

Determine the anticipated thickness of the concrete prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, construct the subgrade true to grade prior to concrete placement. The thickness will be determined by measuring each edge of the completed slab.

### 3.8.4 Surface Evaluation

Provide finished surfaces for each category of the completed work that are uniform in color and free of blemishes and form or tool marks.

## 3.9 SURFACE DEFICIENCIES AND CORRECTIONS

### 3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 6 mm the deficient section will be removed, between regularly scheduled joints, and replaced.

### 3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, reduce high areas either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete must not exceed 5 percent of the area of any integral slab, and the depth of grinding must not exceed 6 mm. Remove and replace pavement areas requiring grade or surface smoothness corrections in excess of the limits specified.

### 3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Contracting Officer and deficiencies in appearance will be identified. Remove and replace areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work.

-- End of Section --

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DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 17 23

PAVEMENT MARKINGS

**08/16, CHG 5: 11/18**

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-- End of Section Table of Contents --

# SECTION 32 17 23

# PAVEMENT MARKINGS
**08/16, CHG 5: 11/18**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

JIS K 5665 (2018) Traffic Paints

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Paint for Roads and Streets; G

Exterior Surface Preparation

Safety Data Sheets; G

SD-06 Test Reports

Test Reports; G

SD-08 Manufacturer's Instructions

Paint for Roads and Streets; G

### 1.3 QUALITY ASSURANCE

#### 1.3.1 Regulatory Requirements

Submit Safety Data Sheets for each product.

### 1.4 DELIVERY AND STORAGE

Deliver paint materials, thermoplastic compound materials, and reflective media in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer.

Provide storage facilities at the job site, only in areas approved by the

Contracting Officer, for maintaining materials at temperatures recommended by the manufacturer.

## 1.5 PROJECT/SITE CONDITIONS

### 1.5.1 Environmental Requirements

#### 1.5.1.1 Weather Limitations for Application

Apply pavement markings to clean, dry surfaces, and unless otherwise approved, only when the air and pavement surface temperature is at least 3 degrees C above the dew point and the air and pavement temperatures are within the limits recommended by the pavement marking manufacturer. Allow pavement surfaces to dry after water has been used for cleaning or rainfall has occurred prior to striping or marking. Test the pavement surface for moisture before beginning work each day and after cleaning. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer.

### 1.5.2 Traffic Controls

Place warning signs near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Place small markers along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

When traffic must be rerouted or controlled to accomplish the work, provide necessary warning signs, flag persons, and related equipment for the safe passage of vehicles.

# PART 2 PRODUCTS

## 2.1 EQUIPMENT

### 2.1.1 Application Equipment

#### 2.1.1.1 Paint Application Equipment

##### 2.1.1.1.1 Hand-Operated, Push-Type Machines

Provide hand-operated push-type applicator machine of a type commonly used for application of water based paint or two-component, chemically curing paint, thermoplastic, or preformed tape, to pavement surfaces for small marking projects, such as legends and cross-walks, automotive parking areas, or surface painted signs. Provide applicator machine equipped with the necessary tanks and spraying nozzles capable of applying paint uniformly at coverage specified. Hand operated spray guns may be used in areas where push-type machines cannot be used.

#### 2.1.1.2 Hand Application

Provide spray guns for hand application of paint in areas where the mobile paint applicator cannot be used.

## 2.2 MATERIALS

### 2.2.1 Paint for Roads and Streets

Shall be hot melt application type, conforming to JIS K 5665.

# PART 3 EXECUTION

## 3.1 EXAMINATION

### 3.1.1 Testing for Moisture

Test the pavement surface for moisture before beginning pavement marking after each period of rainfall, fog, high humidity, or cleaning, or when the ambient temperature has fallen below the dew point. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer or authorized representative.

## 3.2 EXTERIOR SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Remove rubber deposits, existing paint markings, residual curing compounds, and other coatings adhering to the pavement by water blasting or approved chemical removal method. Do not commence painting in any area until the pavement surfaces are dry and clean and have been inspected and approved by the Contracting Officer.

### 3.2.1 Early Painting of Asphalt Pavements

For asphalt pavement systems requiring painting application at less than 30 days, apply the paint and beads at half the normal application rate, followed by a second application at the normal rate after 30 days.

## 3.3 APPLICATION

Apply pavement markings to dry pavements only.

### 3.3.1 Paint

Apply paint with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, painting operations must cease until the cause of the slow drying is determined and corrected.

### 3.3.2 Roads

Apply paint at a rate of 2.6 plus or minus 0.1 square meter per liter.

## 3.4 FIELD QUALITY CONTROL

### 3.4.1 Sampling and Testing

As soon as the paint materials are available for sampling, obtain by random selection from the sealed containers, two quart samples of each batch in the presence of the Contracting Officer. Accomplish adequate mixing prior to sampling to ensure a uniform, representative sample. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Clearly identify samples by designated name, specification number, batch number, project contract number, intended use, and quantity involved.

Test samples by an approved laboratory. If a sample fails to meet specification, replace the material in the area represented by the samples and retest the replacement material as specified above. Submit certified copies of the test reports, prior to the use of the materials at the jobsite. Include in the report of test results a listing of any specification requirements not verified by the test laboratory.

### 3.4.2 Material Inspection

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. Provide test results substantiating conformance to the specified requirements with each certificate of compliance.

### 3.4.3 Dimensional Tolerances

Apply all markings in the standard dimensions provide in the drawings. New markings may deviate a maximum of 10 percent larger than the standard dimension. The maximum deviation allowed when painting over an old marking is up to 20 percent larger than the standard dimensions.

### 3.4.4 Bond Failure Verification

Inspect newly applied markings for signs of bond failure based on visual inspection and comparison to results from Test Stripe Demonstration paragraph.

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SODDING

**04/06, CHG 1: 08/21**

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# SECTION 32 92 23

# SODDING
**04/06, CHG 1: 08/21**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5005 | (2020) Crushed Stone and Manufactured Sand for Concrete |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT-PWCS | (2011) Planting Work Common Specifications |

### 1.2 DEFINITIONS

#### 1.2.1 Stand of Turf

100 percent ground cover of the established species.

### 1.3 RELATED REQUIREMENTS

Section 31 00 00 EARTHWORK and Section 32 05 33 LANDSCAPE ESTABLISHMENT applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

### 1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fertilizer; G

Include physical characteristics, and recommendations.

SD-06 Test Reports

Topsoil composition tests (reports and recommendations); G

SD-07 Certificates

Sod farm certification for sods. Indicate type of sod in

accordance with MLIT-PWCS.

Sand Topping and Gap Filler; G

## 1.5 DELIVERY, STORAGE, AND HANDLING

### 1.5.1 Delivery

#### 1.5.1.1 Sod Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

#### 1.5.1.2 Fertilizer Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to local and federal laws.

### 1.5.2 Storage

#### 1.5.2.1 Sod Storage

Lightly sprinkle with water, cover with moist burlap, straw, or other approved covering; and protect from exposure to wind and direct sunlight until planted. Provide covering that will allow air to circulate so that internal heat will not develop. Do not store sod longer than 24 hours. Do not store directly on concrete or bituminous surfaces.

#### 1.5.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

#### 1.5.2.3 Handling

Do not drop or dump materials from vehicles.

## 1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

### 1.6.1 Restrictions

Do not plant when the ground is snow covered, muddy, or when air temperature exceeds 32 degrees Celsius.

## 1.7 TIME LIMITATIONS

### 1.7.1 Sod

Place sod a maximum of thirty six hours after initial harvesting

# PART 2 PRODUCTS

## 2.1 SODS

### 2.1.1 Classification

Shall be good quality "Kouraishiba" (Zoysia tennuifolia). Machine cut sod

at a uniform thickness of 19 mm within a tolerance of 6 mm, excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends. Broken pads, irregularly shaped pieces, and torn or uneven ends will be rejected.

2.1.2 Purity

Sod species shall be genetically pure, free of weeds, pests, and disease.

2.2 TOPSOIL

2.2.1 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition."

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition."

2.2.3 Composition

Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests Maximum particle size, 19 mm, with maximum 3 percent retained on 6 mm screen. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components shall conform to the following limits:

| | |
|---|---|
| Silt | 25-50 percent |
| Clay | 10-30 percent |
| Sand | 20-35 percent |
| pH | 5.5 to 7.0 |
| Soluble Salts | 600 ppm maximum |

2.3 SOIL CONDITIONERS

Add conditioners to topsoil as required to bring into compliance with "composition" standard for topsoil as specified herein.

2.3.1 Sulfur

100 percent elemental

2.3.2 Sand

Clean and free of materials harmful to plants.

2.3.3 Composted Derivatives

Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:

2.3.3.1 Particle Size

Minimum percent by weight passing:

| | |
|---|---|
| 4.75 mm screen | 95 |
| 2.36 mm screen | 80 |

2.3.3.2 Nitrogen Content

Minimum percent based on dry weight:

| | |
|---|---|
| Fir Sawdust | 0.7 |
| Fir or Pine Bark | 1.0 |

2.4 FERTILIZER

2.4.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

10 percent available nitrogen
10 percent available phosphorus
10 percent available potassium

2.5 WATER

Source of water shall be approved by Contracting Officer and of suitable quality for irrigation containing no element toxic to plant life.

2.6 SAND TOPPING AND GAP FILLER

Clean sand conforming to JIS A 5005 and free of materials harmful to plants.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Extent Of Work

Provide soil preparation (including soil conditioners), fertilizing, and sodding of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.2 Soil Preparation

Provide 100 mm of off-site topsoil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer and soil conditioners into soil a minimum depth of 100 mm by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 19 mm in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

#### 3.1.2.1 Soil Conditioner Application Rates

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site. Apply at a rate of 4 cubic meters per 100 square meters.

#### 3.1.2.2 Fertilizer Application Rates

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site. Apply at a rate of 1.5 kg per 100 square meters.

## 3.2 SODDING

### 3.2.1 Finished Grade and Topsoil

Prior to the commencement of the sodding operation, the Contractor shall verify that finished grades are as indicated on drawings; the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 31 00 00 EARTHWORK.

The prepared surface shall be a maximum 25 mm below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove from the surface debris and stones over a minimum 16 mm in any dimension.

### 3.2.2 Placing

Place sod a maximum of 36 hours after initial harvesting, in accordance with planting operations per MLIT-PWCS as modified herein.

### 3.2.3 Sodding Slopes and Ditches

For slopes 2:1 and greater, lay sod with long edge perpendicular to the contour. For V-ditches and flat bottomed ditches, lay sod with long edge perpendicular to flow of water. Anchor each piece of sod with wood pegs or wire staples maximum 600 mm on center. On slope areas, start sodding at bottom of the slope.

### 3.2.4 Finishing

After completing sodding, blend edges of sodded area smoothly into surrounding area. Air pockets shall be eliminated and a true and even surface shall be provided. Frayed edges shall be trimmed and holes and missing corners shall be patched with sod.

### 3.2.5 Rolling

Immediately after sodding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 134 kg per m for each foot of roller width.

### 3.2.6 Watering

Start watering areas sodded as required by daily temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to minimum depth of 150 mm. Run-off, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or plant material shall be prevented.

## 3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

## 3.4 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

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DIVISION 33 - UTILITIES

SECTION 33 11 00

WATER UTILITY DISTRIBUTION PIPING

**02/18**

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# SECTION 33 11 00

# WATER UTILITY DISTRIBUTION PIPING
**02/18**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5314 | (2014) Mortar Lining for Ductile Iron Pipes |
| JIS B 2404 | (2018) Dimensions of Gaskets for Use with Pipe Flanges |
| JIS G 5526 | (2014) Ductile Iron Pipes |
| JIS G 5527 | (2014) Ductile Iron Fittings |
| JIS K 1102 | (2000) Liquid Chlorine for Industrial Use - Determination of the Chlorine Content. |
| JIS S 3200-1 | (1997) Equipment for Water Supply Use - Test methods of Hydrostatic Pressure |

JAPAN WATER WORKS ASSOCIATION (JWWA)

| | |
|---|---|
| JWWA G 113 | (2010) Ductile Iron Pipes for Water Works |
| JWWA K 156 | (2015) Rubber Material for Water Supply Facilities |
| JWWA K 158 | (2017) Polyethylene Sleeve for Ductile Cast Iron Pipe for Water Supply |

JAPAN DUCTILE IRON PIPE ASSOCIATION (JDPA)

| | |
|---|---|
| JDPA T 01 | (2017) Ductile Iron Pipe Laying Standard Manual |
| JDPA Z 2010 | (2009) Synthetic Resin Coating for Ductile Iron Pipes and Fittings |

### 1.2 DEFINITIONS

#### 1.2.1 Water Mains

Water mains include water piping having diameters 100 through 350 mm, specific materials, methods of joining and any appurtenances deemed necessary for a satisfactory system.

### 1.2.2 Water Service Lines

Water service lines include water piping from a water main to a building service at a point approximately 1.5 m from building or the point indicated on the drawings, specific materials, methods of joining and any appurtenances deemed necessary for a satisfactory system.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe, Fittings, Joints and Couplings; G

Disinfection Procedures; G

SD-06 Test Reports

Bacteriological Samples; G

Leakage Test; G

Hydrostatic Test; G

SD-07 Certificates

Pipe, Fittings, Joints and Couplings; G

SD-08 Manufacturer's Instructions

Ductile Iron Piping; G

## 1.4 DELIVERY, STORAGE, AND HANDLING

### 1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling and in accordance with manufacturer's instructions. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, and other accessories free of dirt and debris.

### 1.4.2 Handling

Handle pipe, fittings, and other accessories in accordance with manufacturer's instructions and in a manner to ensure delivery to the trench in sound undamaged condition. Avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place other material, hooks, or pipe inside a pipe or fitting after the coating has been applied. Inspect the pipe for defects before

installation. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. Clean the interior of pipe and accessories of foreign matter before being lowered into the trench and keep them clean during laying operations by plugging. Replace defective material without additional expense to the Government. Store rubber gaskets, not immediately installed, under cover or out of direct sunlight.

# PART 2 PRODUCTS

## 2.1 MATERIALS

Provide all materials in accordance with JIS, JWWA and other approved commercial products meeting Japanese standards as indicated herein. Provide fittings with pressure ratings equivalent to the pressure ratings of the pipe.

### 2.1.1 Pipe, Fittings, Joints And Couplings

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on and rubber-gasketed bell-and-spigot joints. Include information concerning gaskets with submittal for joints and couplings.

#### 2.1.1.1 Ductile-Iron Piping

##### 2.1.1.1.1 Pipe and Fittings

Pipe, except flanged pipe, JIS G 5526 or JWWA G 113. Flanged pipe, JIS G 5527. Fittings, JIS G 5527 or JWWA G 113; fittings with push-on joint ends are to meet the same requirements as fittings with mechanical-joint ends, except for the factory modified bell design. Provide fittings with pressure ratings equivalent to that of the pipe. Provide compatible pipe ends and fittings for the specified joints. Provide cement-mortar lining, JIS A 5314 , twice the standard thickness on pipe and fittings.

##### 2.1.1.1.2 Joints and Jointing Material

Provide push-on joints or mechanical joints for pipe and fittings unless otherwise indicated. Provide mechanical joints where indicated. Provide flanged joints where indicated. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated. Provide insulating joints where indicated. Sleeve-type mechanical couplings in lieu of push-on joints are acceptable, subject to the limitations specified in the paragraph SLEEVE-TYPE MECHANICAL COUPLINGS.

a. Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly as recommended in JWWA K 156.

b. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets as recommended in JWWA K 156.

c. Flanged Joints: Bolts, nuts, and gaskets for flanged connections compatible with JIS G 5527 or JWWA G 113 joints. Provide JIS G 5527 ductile iron flanges. Provide epoxy coated steel set screw flanges. Gasket and lubricants for set screw flanges, in accordance with mechanical-joint gaskets conforming to JWWA K 156 or JIS B 2404.

d. Insulating Joints: Designed to prevent metal-to-metal contact at the joint between adjacent sections of piping. Provide flanged type joint with insulating gasket, insulating bolt sleeves, and insulating washers. Provide full face dielectric type gaskets, for JIS G 5527 fittings. Bolts and nuts, for JIS G 5527 fittings.

e. Sleeve-Type Mechanical Coupled Joints: As specified in the paragraph SLEEVE-TYPE MECHANICAL COUPLINGS.

2.1.1.1.3 Pipe, Joint, and Fitting Coatings

Provide epoxy resin bonded coating meeting the requirements of JDPA Z 2010. Bonded coating shall have minimum thickness of 0.1 mm for pipe and 0.08 mm for bends.

2.1.2 Disinfection

Chlorinating materials are to conform to: Chlorine, Liquid: JIS K 1102; Hypochlorite, Calcium and Sodium: Approved local commercial product.

2.2 ACCESSORIES

2.2.1 Insulating Joints

Provide a rubber-gasketed insulating joint or dielectric coupling between pipe of dissimilar metals which will effectively prevent metal-to-metal contact between adjacent sections of piping.

2.2.2 Bonded Joints

For all ferrous pipe, provide a metallic bond at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous metallic piping to effect continuous conductivity. Provide Size 1/0 copper conductor thermal weld type bond wire designed for direct burial and shaped to stand clear of the joint.

2.2.3 Dielectric Fittings

Install dielectric fittings between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains to prevent metal-to-metal contact of dissimilar metallic piping elements and compatible with the indicated working pressure.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Connections to Existing System

Perform all connections to the existing water system in the presence of the Contracting Officer.

3.1.2 Operation of Existing Valves

Do not operate valves within or directly connected to the existing water system unless expressly directed to do so by the Contracting Officer.

### 3.1.3 Earthwork

Perform earthwork operations in accordance with Section 31 00 00 EARTHWORK.

## 3.2 INSTALLATION

Install all materials in accordance with the applicable reference standard, manufacturers instructions and as indicated herein.

### 3.2.1 Piping

#### 3.2.1.1 General Requirements

Install pipe, fittings, joints and couplings in accordance with the applicable referenced standard, the manufacturer's instructions and as specified herein.

##### 3.2.1.1.1 Termination of Water Lines

Terminate the work covered by this section at a point approximately 1.5 m from the building, unless otherwise indicated.

Do not lay water lines in the same trench with gas lines, fuel lines, electric wiring, or any other utility. Do not install copper tubing in the same trench with ferrous piping materials. Where nonferrous metallic pipe (i.e., copper tubing) crosses any ferrous piping, provide a minimum vertical separation of 300 mm between pipes.

##### 3.2.1.1.2 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Under no circumstances is it permissible to drop or dump pipe, fittings, or other water line material into trenches. Cut pipe cleanly, squarely, and accurately to the length established at the site and work into place without springing or forcing. Replace a pipe or fitting that does not allow sufficient space for installation of jointing material. Blocking or wedging between bells and spigots is not permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at the design elevation and grade. Secure firm, uniform support. Wood support blocking is not permitted. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports for fastening work into place. Make provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been assembled. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Provide a minimum of 760 mm depth of cover over top of pipe under non-traffic areas and minimum of 900 mm under traffic areas.

##### 3.2.1.1.3 Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3.2.1.1.4 Connections to Existing Water Lines

Make connections to existing water lines after coordination with the facility and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped and as indicated.

3.2.1.1.5 Sewer Manholes

No water piping is to pass through or come in contact with any part of a sewer manhole.

3.2.1.1.6 Water Piping Parallel With Sewer Piping

Where the location of the water line is not clearly defined by dimensions on the drawings, do not lay water line closer than 3.0 m, horizontally, from any sewer line.

3.2.1.1.7 Water Piping Crossing Sewer Piping

Provide at least 450 mm above the top (crown) of the sewer piping and the bottom (invert) of the water piping whenever possible. Measure the distance edge-to-edge. Where water lines cross under gravity sewer lines, construct sewer line of JWWA compliant ductile iron water piping with rubber-gasketed joints and no joint located within 3 m horizontally, of the crossing. Lay water lines which cross sewer force mains and inverted siphons at least 600 mm above these sewer lines; when joints in the sewer line are closer than 900 mm horizontally from the water line relay the sewer line to ensure no joint closer than 900 mm.

3.2.1.1.8 Penetrations

Provide ductile-iron or Schedule 40 steel wall sleeves for pipe passing through walls of valve pits and structures. Fill annular space between walls and sleeves with rich cement mortar. Fill annular space between pipe and sleeves with mastic.

3.2.1.2 Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with the paragraph GENERAL REQUIREMENTS and with the requirements of JDPA T 01 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

a. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of pipe manufacturer for joint assembly. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of of pipe manufacturer for joint assembly . Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of

a flanged joint as specified, replace it. Use set screw flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the set screw flange manufacturer. During installation of set screw gasket provide for confinement and compression of gasket when joint to adjoining flange is made. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves are to be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.

b. Allowable Deflection: Follow ductile iron pipe manufacturer's recommendation for the maximum allowable deflection. If the alignment requires deflection in excess of the above limitations, provide special bends or a sufficient number of shorter lengths of pipe to achieve angular deflections within the limit set forth.

c. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene film, in conformance with JWWA K 158.

### 3.2.2 Disinfection

Disinfection of systems supplying non-potable water is not required.

Prior to disinfection, provide disinfection procedures, proposed neutralization and disposal methods of waste water from disinfection as part of the disinfection submittal. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with the applicable JWWA standards. Ensure a free chlorine residual of not less than 10 mg/L after 24 hour holding period and prior to performing bacteriological tests.

### 3.2.3 Flushing

First flush the highly chlorinated water and then collect bacteriological samples. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5 mg/L, the residual chlorine content of the distribution system, or acceptable for domestic use. If the chlorine residual is still elevated from the disinfection, then the result would be false negative. Use neutralizing chemicals as recommended by JWWA standards.

## 3.3 FIELD QUALITY CONTROL

### 3.3.1 Tests

Notify the Contracting Officer a minimum of five days in advance of hydrostatic testing. Coordinate the proposed method for disposal of waste water from hydrostatic testing. Provide documentation that all items of work have been constructed in accordance with the Contract documents.

#### 3.3.1.1 Hydrostatic Test

Test the water system in accordance with the applicable JWWA standards. Test ductile-iron water mains in accordance with the requirements of JIS S 3200-1 for hydrostatic testing. The amount of leakage on

ductile-iron pipelines with mechanical-joints or push-on joints is not to exceed the amounts given in pipe manufacturer's installation instructions. No leakage will be allowed at joints made by any other methods. Do not backfill utility trench or begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 7 days after placing of the concrete.

#### 3.3.1.2 Leakage Test

For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

#### 3.3.1.3 Bacteriological Testing

Perform bacteriological tests in accordance with the applicable JWWA standards. Analyze samples by a certified laboratory, and submit the results of the bacteriological samples.

#### 3.3.1.4 Tracer Wire Continuity Test

Test tracer wire for continuity after service connections have been completed and prior to final pavement or restoration. Verify that tracer wire is locatable with electronic utility locating equipment. Repair breaks or separations and re-test for continuity.

## 3.4 SYSTEM STARTUP

Water mains and appurtenances must be completely installed, disinfected, flushed, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Obtain approval by the Contracting Officer prior to the new water piping being placed into service.

## 3.5 CLEANUP

Upon completion of the installation of water lines and appurtenances, remove all debris and surplus materials resulting from the work.

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SANITARY SEWERAGE

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# SECTION 33 30 00

# SANITARY SEWERAGE
**05/18**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5005 | (2020) Crushed Stone and Manufactured Sand for Concrete |
| JIS A 5308 | (2019) Ready-Mixed Concrete |
| JIS K 6353 | (2011) Rubber Goods for Water Works |
| JIS K 6739 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipe Fittings for Drain |
| JIS K 6741 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipes |

JAPAN SEWAGE WORKS ASSOCIATION (JSWAS)

| | |
|---|---|
| JSWAS K-1 | (2010) Rigid PVC Pipe for Sewer |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Gravity Pipe; G

SD-07 Certificates

Joints and Jointing Material; G

## 1.3 DELIVERY, STORAGE, AND HANDLING

### 1.3.1 Delivery and Storage

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

#### 1.3.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

### 1.3.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench. Store solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe in accordance with the manufacturer's recommendation and discard those materials if the storage period exceeds the recommended shelf life. Discard solvents in use when the recommended pot life is exceeded.

# PART 2 PRODUCTS

## 2.1 SYSTEM DESCRIPTION

### 2.1.1 Sanitary Sewer Gravity Pipeline

Provide building connections of polyvinyl chloride (PVC) plastic pipe. Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein to the extent as indicated on drawings.

## 2.2 MATERIALS

Provide materials conforming to the respective specifications and other requirements specified below. Submit manufacturer's product specification,standard drawings or catalog cuts.

### 2.2.1 Gravity Pipe

#### 2.2.1.1 PVC Gravity Sewer Piping

##### 2.2.1.1.1 Pipe and Fittings

a. Pipe: JIS K 6741, Class VP or VU.

b. Fittings: JIS K 6739

2.2.1.1.2 Joints and Jointing Material

Jointing Materials: Rubber gasket conforming to JIS K 6353. Gaskets shall be suitable for use in sewerage.

2.2.1.1.3 PVC Branch Pipe Connectors

Shall be standard product compatible with the PVC plastic pipe and conforming to JSWAS K-1 and JIS K 6739. Adhesive materials shall be as per branch pipe manufacturer's recommendation.

2.2.2 Gaskets and Connectors

Resilient connectors for making joints between manhole and pipes entering manhole are to conform to pipe manufacturer's standards.

2.2.3 Miscellaneous Items

2.2.3.1 Warning Tape

Provide in accordance with requirements as specified in Section 31 00 00 EARTHWORK

2.2.3.2 Sand Fill

Fill around PVC drainage pipes shall be cleaned sand conforming to JIS A 5005.

2.2.3.3 Surface Cleanouts

Surface cleanout shall have cast iron cover and fitting adaptable for connection to the lower PVC pipe.

2.2.3.4 Concrete Work

Provide portland cement concrete conforming to JIS A 5308, compressive strength at 28 days shall be as specified on drawings. Protect concrete in place from moisture loss for 7 days.

2.2.3.5 Cement Mortar

Cement mortar shall compose of cement, sand and water mixed in proportion of 1 part cement to 2 parts of sand, sufficient water to produce a workable mixture. Mortar shall be used in the work within one hour after mixing.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Installation Drawings

Submit Installation Drawings showing complete detail, both plan and side view details with proper layout and elevations.

3.2 INSTALLATION

Backfill after inspection by the Contracting Officer. Before, during, and after installation, protect plastic pipe and fittings from any environment

that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer.

3.2.1 Connections to Existing Lines

Obtain approval from the Contracting Officer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.2.2 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.2.2.1 Location

Terminate the work covered by this section at a point approximately 1.5 m from the building, unless otherwise indicated.

3.2.2.1.1 Sanitary Sewer Manholes

No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.2.2.2 Earthwork

Perform earthwork operations in accordance with Section 31 00 00 EARTHWORK.

3.2.2.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches.

3.2.3 Special Requirements

3.2.3.1 Installation of PVC Piping

Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.2.4 Concrete Work

Provide concrete to collars of new surface cleanouts.

3.2.5 Miscellaneous Construction and Installation

3.2.5.1 Connecting to Existing Manholes

Connect pipe to existing manholes. Holes for the new pipe shall be at the same location as the removed building connection pipe unless otherwise new hole will be required. Perform cutting and reshaping of the existing hole to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cut the manhole in a manner that will cause the least damage to the walls.

### 3.2.6 Installations of Wye Branches and Branch Connectors

Install wye branches and branch connectors in an existing sewer using a method which does not damage the integrity of the existing sewer. Do not cut into piping for connections except when approved by the Contracting Officer. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, support on a concrete cradle as directed by the Contracting Officer. Provide and install concrete required because of conditions resulting from faulty construction methods or negligence without any additional cost to the Government. Do not damage the existing sewer when installing wye branches in an existing sewer.

## 3.3 FIELD QUALITY CONTROL

The Contracting Officer will conduct field inspections and witness field tests specified in this section. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

### 3.3.1 Tests

Perform field tests and provide labor, equipment, and incidentals required for testing.

#### 3.3.1.1 Leakage Tests for Nonpressure Lines

##### 3.3.1.1.1 PVC Pipelines

Test PVC pipe in accordance with pipe manufacturer's installation instructions.

### 3.3.2 Inspection

-- End of Section --

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SECTION 33 40 00

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**02/10**

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# SECTION 33 40 00

# STORM DRAINAGE UTILITIES
**02/10**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5005 | (2020) Crushed Stone and Manufactured Sand for Concrete |
| JIS A 5308 | (2019) Ready-Mixed Concrete |
| JIS K 6353 | (2011) Rubber Goods for Water Works |
| JIS K 6739 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipe Fittings for Drain |
| JIS K 6741 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipes |

JAPAN SEWAGE WORKS ASSOCIATION (JSWAS)

| | |
|---|---|
| JSWAS K-1 | (2010) Rigid PVC Pipe for Sewer |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control Approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Leakage Test; G

Jointing Material; G

Post-Installation Inspection Report; G

SD-08 Manufacturer's Instructions

Placing Pipe

## 1.3 DELIVERY, STORAGE, AND HANDLING

### 1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

### 1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

# PART 2 PRODUCTS

## 2.1 PIPE FOR STORM DRAINS

Pipe for storm drains shall be of the sizes indicated and shall conform to the requirements specified.

### 2.1.1 Polyvinyl Chloride (PVC) Pipe

a. PVC plastic pipe shall be in conformance with JIS K 6741, Type VP or VU.

b. Fitting for PVC plastic pipe shall be in conformance with JIS K 6739.

c. Jointing material for PVC plastic pipe shall be rubber gasket conforming to JIS K 6353. Gaskets shall be suitable for use in sewerage.

d. PVC branch pipe connectors shall be standard product compatible with the PVC plastic pipe and conforming to JSWAS K-1 and JIS K 6739. Adhesive materials shall be per branch pipe manufacturer's recommendation.

## 2.2 MISCELLANEOUS MATERIALS

### 2.2.1 Sand Fill And Sand

Fill around PVC drainage pipes shall be cleaned sand conforming to JIS A 5005.

## 2.3 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to pipe manufacturer's standards.

## 2.4 WARNING TAPE

Provide in accordance with requirements as specified in Section 31 00 00 EARTHWORK.

## 2.5 CLEANOUTS

Cleanouts installed at vertical PVC downspouts shall use the standard Y-fitting with the compatible PVC cleanout cover conforming to JIS K 6739.

## 2.6 SURFACE CLEANOUTS

Surface cleanout shall have PVC cover and fitting adaptable for connection to the lower PVC pipe. Provide concrete collars to new surface cleanouts.

## 2.7 CONCRETE WORK

Provide portland cement conforming to JIS A 5308, compressive strength at 28 days shall be as specified on drawings. Protect concrete in place from moisture loss for 7 days.

## 2.8 CEMENT MORTAR

Cement mortar shall compose of cement, sand and water mixed in proportion of 1 part cement to 2 parts of sand, sufficient water to produce a workable mixture. Mortar shall be used in the work within one hour after mixing.

# PART 3 EXECUTION

## 3.1 INSTALLATION OF STORM DRAINS

Excavation of trenches, and for appurtenances and backfilling for storm drains, shall be in accordance with the applicable portions of Section 31 00 00 EARTHWORK, and the requirements specified below.

## 3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

### 3.2.1 Plastic Pipe

Use clean sand for bedding, haunching and initial backfill for PVC pipes. Minimum depth of bedding shall be 200 mm

## 3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches

during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed 4.5 percent of the average inside diamater of pipe.

### 3.3.1 Plastic Pipes

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe pointing in the direction of the flow.

## 3.4 JOINTING

### 3.4.1 Plastic Piping

Install pipes and fittings per pipe manufacturer's installation manual.

### 3.4.2 Connecting to Existing Manhole

Connect pipe to existing manhole. Holes for the new pipe shall be at the same location as the removed building connection pipe unless otherwise new hole will be required. Perform cutting and reshaping of the existing hole to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cut manhole in a manner that will cause the least damage to the walls.

### 3.4.3 Installation of Wye Branches and Branch Connectors

Install wye branches and branch connectors in an existing drainage pipe using a method which does not damage the integrity of the existing pipe. Do not cut into piping for connection except when approved by the Contracting Officer. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, support on a concrete cradle as directed by the Contracting Officer. Provide and install concrete required because of conditions resulting from faulty construction methods or negligence without any additional cost to the Government. Do not damage the existing pipe when installing wye branches in an existing drainage line.

## 3.5 BACKFILLING

### 3.5.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded clean sand shall be placed along both sides of pipe in layers not exceeding 150 mm in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 300 mm above the top of the pipe. The remainder of the trench shall be backfilled with select material from excavation or borrow and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 150 mm. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

### 3.5.2 Compaction

#### 3.5.2.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

## 3.6 FIELD QUALITY CONTROL

### 3.6.1 Tests

Testing is the responsibility of the Contractor. Perform all testing and retesting at no additional cost to the Government.

#### 3.6.1.1 Leakage Test

##### 3.6.1.1.1 PVC Pipelines

Test PVC pipe in accordance with pipe manufacturer's installation instructions.

### 3.6.2 Inspection

#### 3.6.2.1 Post-Installation Inspection

Visually inspect each segment of concrete pipe for alignment, settlement, joint separations, soil migration through the joint, cracks, buckling, bulging and deflection. An engineer must evaluate all defects to determine if any remediation or repair is required.

##### 3.6.2.1.1 Post-Installation Inspection Report

The deflection results and final post installation inspection report must include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design, grade, deviation from line, deflection and deformation of flexible pipe, inspector notes, condition of joints, condition of pipe wall (e.g. distress, cracking, wall damage dents, bulges, creases, tears, holes, etc.).

### 3.6.3 Repair Of Defects

#### 3.6.3.1 Leakage Test

When leakage exceeds the maximum amount specified, correct source of excess leakage by replacing damaged pipe and gaskets and retest.

#### 3.6.3.2 Inspection

Replace pipe or repair defects indicated in the Post-Installation Inspection Report.

#### 3.6.3.2.1 Flexible Pipe

Replace pipes having cracks or splits.

## 3.7 PROTECTION

Protect storm drainage piping and adjacent areas from superimposed and external loads during construction.

## 3.8 WARRANTY PERIOD

Pipe segments found to have defects during the warranty period must be replaced with new pipe and retested.

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# SECTION 33 71 02

# UNDERGROUND ELECTRICAL DISTRIBUTION
**02/15**

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Contractor may substitute compatible Japan Industrial Standard (JIS), Ministry of Land, Infrastructure and Transport (MLIT), Japan Electrical Safety Inspection Associations or Japan Power Cable Accessories Association (JCAA) standards for non-Japanese standards, as approved by the Contracting Officer's representative.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE C2 | (2023) National Electrical Safety Code |

JAPANESE ELECTROTECHNICAL COMMITTEE (JEC)

| | |
|---|---|
| JEC 3408 | (2015) High voltage test of extra high voltage (11 kV to 500 kV) cross-linked polyethylene cable and connections |

JAPANESE INDUSTRIAL STANDARDS (JIS)

| | |
|---|---|
| JIS A 5506 | (2008) Manhole Covers for Sewerage Works |
| JIS A 5372 | (2016) Precast Reinforced Concrete Products |
| JIS C 0365 | (2007) Protection Against Electric Shock - Common Aspects for Installation and Equipment |
| JIS C 2336 | (2012) Pressure-sensitive polyvinyl chloride tapes for electrical purposes |
| JIS C 2338 | (2012) Polyester adhesive tape for electrical insulation |
| JIS C 3101 | (1994) Hard-drawn copper wires for electrical purposes |
| JIS C 3102 | (1984) Annealed Copper Wires for Electrical Purposes |
| JIS C 3105 | (1994) Hard-drawn copper stranded conductors |
| JIS C 3605 | (R2002) 600 V Polyethylene Insulated Cables, Type CV |
| JIS C 3612 | (2002) 600V Flame Retardant Polyethylene |

| | |
|---|---|
| | Insulated Wires |
| JIS C 8330 | (1999) Fittings for rigid metal conduits |
| JIS C 8350 | (1999) Fittings for pliable metal conduits |
| JIS C 8380 | (1993) Plastic coated steel pipes for cable-ways |
| JIS C 8430 | (2019) Unplasticized polyvinyl chloride (PVC-U) conduits |
| JIS C 8432 | (2019) Fittings of unplasticized polyvinyl chloride (PVC-U) conduits |
| JIS C 60364-6 | (2010) Low-voltage electrical installations -- Part 6: Verification |
| JIS K 6741 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipes |
| JIS K 6743 | (2016) Unplasticized Poly (Vinyl Chloride) (PVC-U) Pipe Fittings for Water Supply |

JAPAN ELECTRICAL SAFETY INSPECTION ASSOCIATIONS

| | |
|---|---|
| Denki Hoan Kyoukai | Japan Standard for Acceptance Testing and Inspections |

JAPAN POWER CABLE ACCESSORIES ASSOCIATION STANDARDS (JCAA)

| | |
|---|---|
| JCAA A 501 | (1988) Indoor termination connection for 22kV 33kV cross-linked polyethylene insulated power cable |
| JCAA A 502 | (1988) Outdoor termination connection for 22kV 33kV cross-linked polyethylene insulated power cable |

JAPAN WIRE INDUSTRY ASSOCIATION STANDARD (JCS)

| | |
|---|---|
| JCS 1226 | (2003) Soft Stranded Wire |

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM, GOVERNMENT OF JAPAN (MLIT)

| | |
|---|---|
| MLIT DSKKS | Denki Setsubi Kouji Kanri Shishin (DSKKS) Electrical Construction Supervision Guidelines |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 70 | (2023) National Electrical Code |

THE SOCIETY OF HEATING, AIR-CONDITIONING AND SANITARY ENGINEERS OF JAPAN (SHASE)

| | |
|---|---|
| SHASE-S 209 | (2009) Manhole Cover |

## 1.2 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, are as defined.

b. In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

c. Japan voltage range categories are defined as follows:
Low Voltage (Voltages less than 1kV)
High Voltage (Voltages 1kV thru 7kV)
Extra High Voltage (Voltages over 7kV)

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Extra-High voltage cable terminations; G

Live end caps; G

Precast concrete structures; G

Sealing Material

Manhole frames and covers; G

Cable supports (racks, arms and insulators); G

Protective Devices and Coordination Study; G

The study must be submitted with protective device equipment submittals. No time extension or similar contract modifications will be granted for work arising out of the requirements for this study. Approval of protective devices proposed must be based on recommendations of this study. The Government must not be held responsible for any changes to equipment, device ratings, settings, or additional labor for installation of equipment or devices ordered or procured prior to approval of the study.

SD-06 Test Reports

Field Acceptance Checks and Tests;

## 1.4 QUALITY ASSURANCE

### 1.4.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of

similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of IEEE C2 and NFPA 70 unless more stringent requirements are specified or indicated.

1.4.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.2.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.2.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site are not acceptable, unless specified otherwise.

PART 2 PRODUCTS

2.1 CONDUIT, DUCTS, AND FITTINGS

2.1.1 Intermediate Metal Conduit or Type C

2.1.1.1 Intermediate Metal Conduit, PVC Coated or Type C

JIS C 8380, Type C.

2.1.2 Plastic Conduit or Unplasticized Polyvinyl Chloride for Direct Burial and Riser Applications

JIS C 8430 for Type HIVE conduit of diameter of less than 100mm and JIS K 6741 for Type HIVP conduit diameter or 100mm and larger.

2.1.3 Fittings

2.1.3.1 Metal Fittings

JIS C 8330 and JIS C 8350.

2.1.3.2 PVC or Unplasticized Polyvinyl Chloride Conduit Fittings

JIS C 8432 for diameters less than 100mm, JIS K 6743 for diameters 100mm or larger.

## 2.2 LOW VOLTAGE INSULATED CONDUCTORS AND CABLES

Insulated conductors must be rated 600 volts and conform to the requirements of applicable codes and standards, including listing requirements. Wires and cables manufactured more than 12 months prior to date of delivery to the site are not acceptable.

### 2.2.1 Conductor Types

Cable and duct sizes indicated are for copper conductors and EM-CE unless otherwise noted. Conductors 5.5 sqmm and smaller must be solid. Conductors 8 sqmm and larger must be stranded. All conductors must be copper.

### 2.2.2 Conductor Material

Unless specified or indicated otherwise or required, wires in conduit, other than service entrance, must be 600-volt,conforming to Type EM-IE conforming to JIS C 3612 or Type EM-CE, EM-CET or EM-ECEQ conforming to JIS C 3605. Copper conductors must be annealed copper complying with JCS 1226 and JIS C 3102 and JIS C 3105.

### 2.2.3 Jackets

Multiconductor cables must have an overall PVC outer jacket.

### 2.2.4 Cable Marking

Insulated conductors must have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout the cable length.

Identify each cable by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag must contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

Conductors must be color coded. Provide conductor identification within each enclosure where a tap, splice, or termination is made. Conductor identification must be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, heat shrink type sleeves,or colored electrical tape. Control circuit terminations must be properly identified. Color must be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals must be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems must be as follows:

a. Three-phase - Primary

   (1) Phase A - red

   (2) Phase B - white

   (3) Phase C - blue

b. Three-phase - Secondary

(1) Phase A - red

(2) Phase B - black

(3) Phase C - blue

## 2.3 LOW VOLTAGE WIRE CONNECTORS AND TERMINALS

Must provide a uniform compression over the entire conductor contact surface. Use solderless terminal lugs on stranded conductors.

a. For use with copper conductors:

## 2.4 EXTRA-HIGH VOLTAGE CABLE TERMINATIONS

Provide indoor terminator/outdoor terminations with skirts. JCAA A 501 and JCAA A 502 for 22kV and 33kVJEC 3408 for 66kV and 77kV; of the molded elastomer, prestretched elastomer, or heat-shrinkable elastomer. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations, where required, must be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, or armor. Terminations must be provided in a kit, including: skirts, stress control terminator, ground clamp, connectors, lugs, and complete instructions for assembly and installation. Terminations must be the product of one manufacturer, suitable for the type, diameter, insulation class and level, and materials of the cable terminated. Do not use separate parts of copper or copper alloy in contact with aluminum alloy parts in the construction or installation of the terminator.

## 2.5 TAPE

### 2.5.1 Insulating Tape

JIS C 2336 and JIS C 2338, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

### 2.5.2 Buried Warning and Identification Tape

Provide detectable tape .

## 2.6 PULL ROPE

Plastic or flat pull line (bull line) having a minimum tensile strength of 890 N.

## 2.7 GROUNDING AND BONDING

### 2.7.1 Grounding Conductors

Stranded-bare copper conductors must conform to JIS C 3105 soft-drawn unless otherwise indicated. Solid-bare copper conductors must conform to JIS C 3101 for sizes 8 sqmm and smaller. Insulated conductors must be of the same material as phase conductors and green color-coded, except that conductors must be rated no more than 600 volts. Aluminum is not acceptable..

## 2.8 UNDERGROUND STRUCTURES

Provide precast concrete underground structures or standard type cast-in-place manhole types as indicated, conforming to JIS A 5372. Top, walls, and bottom must consist of reinforced concrete. Walls and bottom must be of monolithic concrete construction. Locate duct entrances and windows near the corners of structures to facilitate cable racking. Covers must fit the frames without undue play. Form steel and iron to shape and size with sharp lines and angles. Castings must be free from warp and blow holes that may impair strength or appearance. Exposed metal must have a smooth finish and sharp lines and arises. Provide necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place before depositing concrete. Install a pulling-in iron in the wall opposite each duct line entrance. Cable racks, including rack arms and insulators, must be adequate to accommodate the cable.

### 2.8.1 Cast-In-Place Concrete Structures

Concrete must conform to Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE. Construct walls on a footing of cast-in-place concrete except that precast concrete base sections may be used for precast concrete manhole risers.

### 2.8.2 Precast Concrete Structures, Risers and Tops

Precast concrete underground structures may be provided in lieu of cast-in-place subject to the requirements specified below. Precast units must be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast manholes.

#### 2.8.2.1 General

Precast concrete structures must have the same accessories and facilities as required for cast-in-place structures. Likewise, precast structures must have plan area and clear heights not less than those of cast-in-place structures. Concrete materials and methods of construction must be the same as for cast-in-place concrete construction, as modified herein. Slope in floor may be omitted provided precast sections are poured in reinforced steel forms. Concrete for precast work must have a 28-day compressive strength of not less than 30 MPa. Structures may be precast to the design and details indicated for cast-in-place construction, precast monolithically and placed as a unit, or structures may be assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. Structures must be identified with the manufacturer's name embedded in or otherwise permanently attached to an interior wall face.

#### 2.8.2.2 Design for Precast Structures

In the absence of detailed on-site soil information, design for the following soil parameters/site conditions:

a. Angle of Internal Friction (phi) = 0.523 rad

b. Unit Weight of Soil (Dry) = 1760 kg/m$^3$, (Saturated) = 2080 kg/m$^3$

c. Coefficient of Lateral Earth Pressure (Ka) = 0.33

d. Ground Water Level = 915 mm below ground elevation

e. Vertical design loads must include full dead, superimposed dead, and live loads including a 30 percent magnification factor for impact. Live loads must consider all types and magnitudes of vehicular (automotive, industrial, or aircraft) traffic to be encountered. The minimum design vertical load must be for H20 highway loading.

f. Horizontal design loads must include full geostatic and hydrostatic pressures for the soil parameters, water table, and depth of installation to be encountered. Also, horizontal loads imposed by adjacent structure foundations, and horizontal load components of vertical design loads, including impact, must be considered, along with a pulling-in iron design load of 26,700 N.

g. Each structural component must be designed for the load combination and positioning resulting in the maximum shear and moment for thatparticular component.

h. Design must also consider the live loads induced in the handling, installation, and backfilling of the manholes. Provide lifting devices to ensure structural integrity during handling and installation.

2.8.2.3 Construction

Structure top, bottom, and wall must be of a uniform thickness of not less than 150 mm. Thin-walled knock-out panels for designed or future duct bank entrances are not permitted. Provide quantity, size, and location of duct bank entrance windows as directed, and cast completely open by the precaster. Size of windows must exceed the nominal duct bank envelope dimensions by at least 305 mm vertically and horizontally to preclude in-field window modifications made necessary by duct bank misalignment. However, the sides of precast windows must be a minimum of 150 mm from the inside surface of adjacent walls, floors, or ceilings. Form the perimeter of precast window openings to have a keyed or inward flared surface to provide a positive interlock with the mating duct bank envelope. Provide welded wire fabric reinforcing through window openings for in-field cutting and flaring into duct bank envelopes. Provide additional reinforcing steel comprised of at least two No. 13 bars around window openings. Provide drain sumps a minimum of 305 mm in diameter and 100 mm deep for precast structures.

2.8.2.4 Joints

Provide tongue-and-groove joints on mating edges of precast components. Shiplap joints are not allowed. Design joints to firmly interlock adjoining components and to provide waterproof junctions and adequate shear transfer. Seal joints watertight using preformed plastic strip. Install sealing material in strict accordance with the sealant manufacturer's printed instructions. Provide waterproofing at conduit/duct entrances into structures, and where access frame meets the top slab, provide continuous grout seal.

2.8.3 Manhole Frames and Covers

Provide cast iron frames and covers for manholes conforming to SHASE-S 209

and JIS A 5506. Cast the words "ELECTRIC" or "TELECOMMUNICATIONS" in the top face of power and telecommunications manhole covers, respectively.

## 2.9 CABLE SUPPORTS (RACKS, ARMS, AND INSULATORS)

The metal portion of racks and arms must be zinc-coated after fabrication.

### 2.9.1 Cable Rack Stanchions

The wall bracket or stanchion must be 100 mm by approximately 38 mm by 4.76 mm channel steel, or 100 mm by approximately 25 mm glass-reinforced nylon with recessed bolt mounting holes, 1220 mm long (minimum) in manholes. Slots for mounting cable rack arms must be spaced at 200 mm intervals.

### 2.9.2 Rack Arms

Cable rack arms must be steel or malleable iron or glass reinforced nylon and must be of the removable type. Rack arm length must be a minimum of 200 mm and a maximum of 305 mm.

### 2.9.3 Insulators

Insulators for metal rack arms must be dry-process glazed porcelain. Insulators are not required for nylon arms.

## 2.10 CABLE TAGS IN MANHOLES

Provide tags for each power cable located in manholes. The tags must be polyethylene. Do not provide handwritten letters. The first position on the power cable tag must denote the voltage. The second through sixth positions on the tag must identify the circuit. The next to last position must denote the phase of the circuit and include the Greek "phi" symbol. The last position must denote the cable size. As an example, a tag could have the following designation: "11.5 NAS 1-8(Phase A)500," denoting that the tagged cable is on the 11.5kV system circuit number NAS 1-8, underground, Phase A, sized at 500 kcmil.

### 2.10.1 Polyethylene Cable Tags

Provide tags of polyethylene that have an average tensile strength of 22.4 MPa; and that are 2 millimeter thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 77 degrees C. Provide 1.3 mm (minimum) thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties must have a minimum loop tensile strength of 778.75 N. The cable tags must have black block letters, numbers, and symbols 25 mm high on a yellow background. Letters, numbers, and symbols must not fall off or change positions regardless of the cable tags' orientation.

## 2.11 EXTRA-HIGH VOLTAGE ABOVE GROUND CABLE TERMINATING CABINETS

Cable terminating cabinets must be hook-stick operable, deadfront construction.

Ratings at 60 Hz must be:

| | |
|---|---|
| Nominal voltage (kV) | 13.8 |
| Rated maximum voltage (kV) | 15 |
| Rated continuous current (A) | 200 |

## 2.12 LOW VOLTAGE ABOVE GROUND TERMINATION PEDESTAL

Provide copolymer polypropylene, low voltage above ground termination pedestal manufactured through an injection molding process. Pedestals must resist fertilizers, salt air environments and ultra-violet radiation. Pedestal top must be imprinted with a "WARNING" and "ELECTRIC" identification. Pedestal must contain three or four lay-in six port connectors. Connectors must be dual rated for aluminum or copper, and capable of terminating conductors ranging from 5.5 sqmm to 250 sqmm. Protect each connector with a clear, hard lexan (plastic) cover. Pedestal must be provided with rust-free material and stainless steel hardware. Pedestal must be lockable.

## 2.13 PROTECTIVE DEVICES AND COORDINATION

Provide protective devices and coordination as specified in Section 26 28 01.00 10 COORDINATED POWER SYSTEM PROTECTION.

# PART 3 EXECUTION

## 3.1 INSTALLATION

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2.

## 3.2 CABLE INSPECTION

Inspect each cable reel for correct storage positions, signs of physical damage, and broken end seals prior to installation. If end seal is broken, remove moisture from cable prior to installation in accordance with the cable manufacturer's recommendations.

## 3.3 CABLE INSTALLATION PLAN AND PROCEDURE

Obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature limits for installation, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, maximum allowable pulling tension, and maximum allowable sidewall bearing pressure. Prepare a checklist of significant requirements and submit along with the manufacturer's instructions in accordance with SUBMITTALS. Install cable strictly in accordance with the cable manufacturer's recommendations and the approved installation plan.

## 3.4 DIRECT BURIAL CABLE SYSTEM

Cables must be buried directly in the earth below the frostline as indicated.

### 3.4.1 Identification Markers

Provide a marker at each change of direction of cable.

## 3.5 UNDERGROUND CONDUIT AND DUCT SYSTEMS

### 3.5.1 Requirements

Run conduit in straight lines except where a change of direction is necessary. Provide numbers and sizes of ducts as indicated. Provide a 100 sqmm bare copper grounding conductor for extra-high-voltage distribution duct banks as indicated in drawings. Bond grounding conductor to ground rings (loops) in all manholes and to ground rings (loops) at all equipment slabs (pads). Route grounding conductor into manholes with the duct bank (sleeving is not required). Ducts must have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of 100 mm per 30 m. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Provide ducts with end bells whenever duct lines terminate in structures.

Perform changes in ductbank direction as follows:

a. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable.

b. The minimum manufactured bend radius must be 450 mm for ducts of less than 80 mm diameter, and 900 mm for ducts 80 mm or greater in diameter.

c. As an exception to the bend radius required above, provide field manufactured longsweep bends having a minimum radius of 7.6 m for a change of direction of more than 5 degrees, either horizontally or vertically, using a combination of curved and straight sections. Maximum manufactured curved sections: 30 degrees.

### 3.5.2 Treatment

Ducts must be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers must be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer must be used whenever an existing duct is connected to a duct of different material or shape. Ducts must be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts must be thoroughly cleaned before being laid. Plastic ducts must be stored on a flat surface and protected from the direct rays of the sun.

### 3.5.3 Conduit Cleaning

As each conduit run is completed, for conduit sizes 75 mm and larger, draw a flexible testing mandrel approximately 305 mm long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 75 mm, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

### 3.5.4 Jacking and Drilling Under Roads and Structures

Conduits to be installed under existing paved areas which are not to be disturbed, and under roads and railroad tracks, must be zinc-coated, rigid steel, jacked into place. Where ducts are jacked under existing pavement, rigid steel conduit must be installed because of its strength. To protect the corrosion-resistant conduit coating, predrilling or installing conduit inside a larger iron pipe sleeve (jack-and-sleeve) is required. For crossings of existing railroads and airfield pavements greater than 15 m in length, the predrilling method or the jack-and-sleeve method will be used. Separators or spacing blocks must be made of steel, concrete, plastic, or a combination of these materials placed not farther apart than 1.2 m on centers.

### 3.5.5 Multiple Conduits

Separate multiple conduits by a minimum distance of 75 mm. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly must consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 3050 mm of conduit assembly.

### 3.5.6 Conduit Plugs and Pull Rope

New conduit indicated as being unused or empty must be provided with plugs on each end. Plugs must contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 915 mm of slack at each end of unused or empty conduits.

### 3.5.7 Conduit and Duct Without Concrete Encasement

Depths to top of the conduit must be not less than 610 mm below finished grade. Provide not less than 75 mm clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 75 mm, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 6.25 mm sieve. The first 150 mm layer of backfill cover must be sand compacted as previously specified. The rest of the excavation must be backfilled and compacted in 75 to 150 mm layers. Provide color, type and depth of warning tape.

### 3.5.8 Duct Encased in Concrete

#### 3.5.8.1 Connections to Manholes

Duct bank envelopes connecting to underground structures must be flared to have enlarged cross-section at the manhole entrance to provide additional shear strength. Dimensions of the flared cross-section must be larger than the corresponding manhole opening dimensions by no less than 300 mm in each direction. Perimeter of the duct bank opening in the underground structure must be flared toward the inside or keyed to provide a positive interlock between the duct bank and the wall of the structure. Use vibrators when this portion of the encasement is poured to assure a seal between the envelope and the wall of the structure.

### 3.5.9 Duct Sealing

Seal all electrical penetrations for radon mitigation, maintaining integrity of the vapor barrier, and to prevent infiltration of air, insects, and vermin.

## 3.6 CABLE PULLING

Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the manhole or buildings of the highest elevation. Use flexible cable feeds to convey cables through manhole opening and into duct runs. Do not exceed the specified cable bending radii when installing cable under any conditions, including turnups into switches, transformers, switchgear, switchboards, and other enclosures. Cable with tape or wire shield must have a bending radius not less than 12 times the overall diameter of the completed cable. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.

### 3.6.1 Cable Lubricants

Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables.

## 3.7 CONDUCTORS INSTALLED IN PARALLEL

Conductors must be grouped such that each conduit of a parallel run contains 1 Phase A conductor, 1 Phase B conductor, 1 Phase C conductor, and 1 neutral conductor.

## 3.8 LOW VOLTAGE CABLE SPLICING AND TERMINATING

Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Do not allow the cables to be moved until after the splicing material has completely set.

## 3.9 EXTRA-HIGH VOLTAGE CABLE TERMINATIONS

Make terminations in accordance with the written instruction of the termination kit manufacturer.

## 3.10 CABLE END CAPS

Cable ends must be sealed at all times with coated heat shrinkable end caps. Cables ends must be sealed when the cable is delivered to the job site, while the cable is stored and during installation of the cable. The caps must remain in place until the cable is spliced or terminated. Sealing compounds and tape are not acceptable substitutes for heat shrinkable end caps. Cable which is not sealed in the specified manner at all times will be rejected.

## 3.11 LIVE END CAPS

Provide live end caps for single conductor extra-high voltage cables where indicated.

## 3.12 GROUNDING SYSTEMS

IEEE C2 and JIS C 0365, except provide grounding systems with a resistance to solid earth ground not exceeding 25 ohms.

### 3.12.1 Grounding Electrodes

Provide cone pointed driven ground rods driven full depth plus 300 mm, installed to provide an earth ground of the appropriate value for the particular equipment being grounded. If the specified ground resistance is not met, an additional ground rod must be provided (placed not less than 1830 mm from the first rod). Should the resultant (combined) resistance exceed the specified resistance, measured not less than 48 hours after rainfall, notify the Contracting Officer immediately.

### 3.12.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies must be as recommended by the manufacturer. An embossing die code or other standard method must provide visible indication that a connector has been adequately compressed on the ground wire.

### 3.12.3 Grounding Conductors

Provide bare grounding conductors, except where installed in conduit with associated phase conductors. Ground cable sheaths, cable shields, conduit, and equipment with 14 sqmm. Ground other noncurrent-carrying metal parts and equipment frames of metal-enclosed equipment. Ground metallic frames and covers of handholes and pull boxes with a braided, copper ground strap with equivalent ampacity of 14 sqmm. Provide direct connections to the grounding conductor with 600 v insulated, full-size conductor for each grounded neutral of each feeder circuit, which is spliced within the manhole.

### 3.12.4 Ground Cable Crossing Expansion Joints

Protect ground cables crossing expansion joints or similar separations in structures and pavements by use of approved devices or methods of installation which provide the necessary slack in the cable across the joint to permit movement. Use stranded or other approved flexible copper cable across such separations.

### 3.12.5 Manhole Grounding

Loop a 100 sqmm grounding conductor around the interior perimeter, approximately 305 mm above finished floor. Secure the conductor to the manhole walls at intervals not exceeding 914 mm. Connect the conductor to the manhole grounding electrode with 100 sqmm conductor. Connect all incoming 100 sqmm grounding conductors to the ground loop adjacent to the

point of entry into the manhole. Bond the ground loop to all cable shields, metal cable racks, and other metal equipment with a minimum 14 sqmm conductor.

### 3.12.6 Fence Grounding

Provide grounding for fences as indicated. Provide grounding for fences with a ground rod at each fixed gate post and at each corner post. Drive ground rods until the top is 305 mm below grade. Attach a 22 sqmm copper conductor, by exothermic weld to the ground rods and extend underground to the immediate vicinity of fence post. Lace the conductor vertically into 305 mm of fence mesh and fasten by two approved bronze compression fittings, one to bond wire to post and the other to bond wire to fence. Each gate section must be bonded to its gatepost by a 3 by 25 mm flexible braided copper strap and ground post clamps. Clamps must be of the anti-electrolysis type.

## 3.13 EXCAVATING, BACKFILLING, AND COMPACTING

Provide in accordance with Section 31 00 00 EARTHWORK.

## 3.14 CAST-IN-PLACE CONCRETE

### 3.14.1 Concrete Slabs (Pads) for Equipment

Unless otherwise indicated, the slab must be at least 200 mm thick, reinforced with a 150 mm by 150 mm - MW19 by MW19 (6 by 6 - W2.9 by W2.9) mesh, placed uniformly 100 mm from the top of the slab. Slab must be placed on a 150 mm thick, well-compacted gravel base. Top of concrete slab must be approximately 100 mm above finished grade with gradual slope for drainage. Edges above grade must have 15 mm chamfer. Slab must be of adequate size to project at least 200 mm beyond the equipment.

Stub up conduits, with bushings, 50 mm into cable wells in the concrete pad. Coordinate dimensions of cable wells with transformer cable training areas.

### 3.14.2 Sealing

When the installation is complete, seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals must be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

## 3.15 FIELD QUALITY CONTROL

### 3.15.1 Performance of Field Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, and include the following visual and mechanical inspections and electrical tests, performed in accordance with Denki Hoan Kyoukai and MLIT DSKKS.

#### 3.15.1.1 Extra-High Voltage Cables

Perform tests after installation of cable, splices, and terminators and before terminating to equipment or splicing to existing circuits.

a. Visual and Mechanical Inspection

(1) Inspect exposed cable sections for physical damage.

(2) Verify that cable is supplied and connected in accordance with contract plans and specifications.

(3) Inspect for proper shield grounding, cable support, and cable termination.

(4) Verify that cable bends are not less than ICEA or manufacturer's minimum allowable bending radius.

(5) Inspect for proper fireproofing.

(6) Visually inspect jacket and insulation condition.

(7) Inspect for proper phase identification and arrangement.

b. Electrical Tests

(1) Perform a shield continuity test on each power cable by ohmmeter method. Record ohmic value, resistance values in excess of 10 ohms per 1000 feet of cable must be investigated and justified.

(2) Perform acceptance test on new cables before the new cables are connected to existing cables and placed into service, including terminations and joints. Perform maintenance test on complete cable system after the new cables are connected to existing cables and placed into service, including existing cable, terminations, and joints. Tests must be very low frequency (VLF) alternating voltage withstand tests. VLF test frequency must be 0.05 Hz minimum for a duration of 60 minutes using a sinusoidal waveform. Test voltages must be as follows:

| CABLE RATING AC TEST VOLTAGE for ACCEPTANCE TESTING | |
|---|---|
| 3.3kV | 9kV (peak) |
| 5 kV | 10kV rms(peak) |
| 6.6 kV | 17kV rms(peak) |
| 8 kV | 13kV rms(peak) |
| 15 kV | 20kV rms(peak) |
| 22 kV | 44kV rms(peak) |
| 25 kV | 31kV rms(peak) |
| 33 kV | 63kV (peak) |
| 35 kV | 44kV rms(peak) |

| CABLE RATING AC TEST VOLTAGE for ACCEPTANCE TESTING | |
|---|---|
| 66 kV | 85kV (peak) |
| 77 kV | 95kV (peak) |

| CABLE RATING AC TEST VOLTAGE for MAINTENANCE TESTING | |
|---|---|
| 3.3kV | Per manufacturer requirements. |
| 5 kV | 7kV rms(peak) |
| 6.6 kV | Per manufacturer requirements. |
| 8 kV | 10kV rms(peak) |
| 15 kV | 16kV rms(peak) |
| 22 kV | Per manufacturer requirements. |
| 25 kV | 23kV rms(peak) |
| 33 kV | Per manufacturer requirements. |
| 35 kV | 33kV rms(peak) |
| 66 kV | Per manufacturer requirements. |
| 77 kV | Per manufacturer requirements. |

(3) In lieu of the acceptance testing required in item (2), High Voltage Direct Current (HVDC) test is an alternative acceptance test on newly installed cables. Maximum applied DC test voltage shall be determined in consultation with the manufacturer of the cable and cable accessories for the type of cable being tested. The maximum test voltage to be maintained for 10 minutes. After reaching the maximum test voltage, the current magnitude should be recorded at least twice: once at approximately 2 min and again at the end of the test period (10 min) Contractor shall submit test procedure and standard use as reference for testing to the government for review and approval.

3.15.1.2 Low Voltage Cables, 600-Volt

Perform tests after installation of cable, splices and terminations and before terminating to equipment or splicing to existing circuits.

a. Visual and Mechanical Inspection

(1) Inspect exposed cable sections for physical damage.

(2) Verify that cable is supplied and connected in accordance with contract plans and specifications.

(3) Verify tightness of accessible bolted electrical connections.

(4) Inspect compression-applied connectors for correct cable match and indentation.

(5) Visually inspect jacket and insulation condition.

(6) Inspect for proper phase identification and arrangement.

b. Electrical Tests

(1) Perform insulation resistance tests on wiring 14 sqmm and larger diameter using instrument which applies voltage of approximately 1000 volts dc for one minute.

(2) Perform continuity tests to insure correct cable connection.

3.15.1.3 Grounding System

a. Visual and mechanical inspection

Inspect ground system for compliance with contract plans and specifications.

b. Electrical tests

Perform ground-impedance measurements utilizing the fall-of-potential method in accordance with JIS C 60364-6. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable ground resistance tester in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument must be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test. Provide site diagram indicating location of test probes with associated distances, and provide a plot of resistance vs. distance.

3.15.2 Follow-Up Verification

Upon completion of acceptance checks and tests, show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer must be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --