DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND, MID-ATLANTIC
MARINE CORPS AIR STATION, CHERRY POINT, NORTH CAROLINA

RENOVATE B3918 RELOCATE POST OFFICE

AT THE
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
STATION PROJECT NO: 7413945

DESIGNED BY:

MBF ARCHITECTS, PA
317-C POLLOCK STREET
NEW BERN, NORTH CAROLINA 28560

15 April 2025

SPECIFICATION PREPARED BY:

DARDEN J. EURE, III, MBF ARCHITECTS

15 APRIL 2025

SPECIFICATION APPROVED BY:

Design Director: _____
PATRICK FAULKNER, PE

Date: _____

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DOCUMENT 00 01 15

LIST OF DRAWINGS
02/24

PART 1 GENERAL

1.1 SUMMARY

This section lists the drawings for the project pursuant to contract clause "DFARS 252.236-7001, Contract Drawings and Specifications."

1.2 CONTRACT DRAWINGS

Contract drawings are as follows:

NAVFAC NO	DWG NO	SHEET TITLE
G	GENERAL	
12913050	G-001	TITLE SHEET
12913051	G-002	INDEX OF DRAWINGS
GI	LIFE SAFETY	
12913052	GI001	LIFE SAFETY NOTES AND LEGEND
12913053	GI101	LIFE SAFETY FIRST FLOOR PLAN
C	CIVIL	
12913054	C-100	OVERALL SITE PLAN
12913055	C-101	ENLARGED SITE PLAN - EXISTING CONDITIONS AND DEMOLITION
12913056	C-102	ENLARGED SITE PLAN - NEW WORK
12913057	C-103	ENLARGED SITE PLAN - EXISTING CONDITIONS AND DEMOLITION
12913058	C-104	ENLARGED SITE GRADING PLAN
12913059	C-501	DETAILS
12913060	C-502	DETAILS
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12913061	A-001	SYMBOLS AND ABBREVIATIONS
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12913063	AD102	FLOOR PLAN - EXISTING/DEMOLITION - AREA B
12913064	AD103	FLOOR PLAN - EXISTING/DEMOLITION - AREAS G&H
12913065	AD104	REFLECTED CEILING PLAN - EXISTING/DEMOLITION - OVERALL
12913066	AD105	REFLECTED CEILING PLAN - EXISTING/DEMOLITION - AREAS G&H
12913067	AD106	REFLECTED CEILING PLAN - EXISTING/DEMOLITION - AREA H
12913068	AD201	EXTERIOR ELEVATIONS - EXTERIOR/DEMOLITION
12913069	A-101	FLOOR PLAN - CONSTRUCTION - OVERALL
12913070	A-102	FLOOR PLAN - CONSTRUCTION - AREA A
12913071	A-103	FLOOR PLAN - CONSTRUCTION - AREA B
12913072	A-104	FLOOR PLAN - CONSTRUCTION - AREAS G&H
12913073	A-105	REFLECTED CEILING PLAN - CONSTRUCTION - OVERALL
12913074	A-106	REFLECTED CEILING PLAN - CONSTRUCTION - AREA A
12913075	A-107	REFLECTED CEILING PLAN - CONSTRUCTION - AREAS G&H
12913076	A-108	REFLECTED CEILING PLAN - CONSTRUCTION - AREA H
12913077	A-109	ROOF PLAN - CONSTRUCTION - AREAS G&H
12913078	A-201	EXTERIOR ELEVATIONS - CONSTRUCTION
12913079	A-401	ENLARGED TOILET PLANS AND ELEVATIONS
12913080	A-402	ENLARGED TOILET ELEVATIONS AND DETAILS
12913081	A-403	INTERIOR ELEVATIONS

NAVFAC NO	DWG NO	SHEET
12913082	A-404	INTERIOR ELEVATIONS
12913083	A-405	EQUIPMENT ACCESS PLATFORM PLANS AND SECTIONS
12913084	A-501	WALL TYPES
12913085	A-502	WALL DETAILS
12913086	A-503	INTERIOR DETAILS
12913087	A-504	EXTERIOR DETAILS
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12913093	A-901	RATED WALL TYPICAL CONDITIONS
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12913099	I-121	SIGNAGE PLAN - AREA A
12913100	I-122	SIGNAGE PLAN - AREA G&H
12913101	I-201	INTERIOR ELEVATIONS
12913102	I-202	INTERIOR ELEVATIONS
12913103	I-203	INTERIOR ELEVATIONS
12913104	I-301	CASEWORK SECTIONS
12913105	I-302	CASEWORK SECTIONS
12913106	I-401	ENLARGED PLAN VIEWS
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12913113	FD103	FIRE PROTECTION DEMOLITION PLAN - AREA C
12913114	FD104	FIRE PROTECTION DEMOLITION PLAN - AREA D
12913115	FD105	FIRE PROTECTION DEMOLITION PLAN - AREA E
12913116	FD106	FIRE PROTECTION DEMOLITION PLAN - AREA F
12913117	FD107	FIRE PROTECTION DEMOLITION PLAN - AREA G
12913118	FD108	FIRE PROTECTION DEMOLITION PLAN - AREA H
12913119	FA001	FIRE ALARM NOTES AND LEGEND
12913120	FA101	FIRE ALARM FLOOR PLAN - AREA A
12913121	FA102	FIRE ALARM FLOOR PLAN - AREA B
12913122	FA103	FIRE ALARM FLOOR PLAN - AREA C
12913123	FA104	FIRE ALARM FLOOR PLAN - AREA D
12913124	FA105	FIRE ALARM FLOOR PLAN - AREA E
12913125	FA106	FIRE ALARM FLOOR PLAN - AREA F
12913126	FA107	FIRE ALARM FLOOR PLAN - AREA G
12913127	FA108	FIRE ALARM FLOOR PLAN - AREA H
12913128	FA501	FIRE ALARM DETAILS
12913129	FX001	FIRE SPRINKLER NOTES AND LEGEND
12913130	FX002	FIRE SPRINKLER FLOOR PLAN - OVERALL
12913131	FX101	FIRE SPRINKLER FLOOR PLAN - AREA G

NAVFAC NO	DWG NO	SHEET
12913132	FX102	FIRE SPRINKLER FLOOR PLAN - AREA H
P	PLUMBING	
12913133	P-001	PLUMBING COVER SHEET
12913134	PD101	FIRST FLOOR PLAN - DEMOLITION - PLUMBING
12913135	P-101	FIRST FLOOR PLAN - WASTE AND VENT
12913136	P-102	FIRST FLOOR PLAN - WATER
12913137	P-201	ENLARGED PLANS - PLUMBING
12913138	P-501	PLUMBING DETAILS
12913139	P-601	PLUMBING SCHEDULES
12913140	P-701	RISER DIAGRAMS - PLUMBING
M	MECHANICAL	
12913141	M-001	MECHANICAL COVER SHEET
12913142	MD101	FIRST FLOOR - DEMOLITION - DUCTWORK
12913143	MD102	ROOF - DEMOLITION - EQUIPMENT
12913144	MD301	MECHANICAL SECTION VIEWS - DEMOLITION
12913145	M-101	FIRST FLOOR - CONSTRUCTION - MECHANICAL
12913146	M-102	ROOF - NEW WORK
12913147	M-501	MECHANICAL DETAILS
12913148	M-502	MECHANICAL DETAILS
12913149	M-503	MECHANICAL DETAILS
12913150	M-504	MECHANICAL DETAILS
12913151	M-505	MECHANICAL DETAILS
12913152	M-601	MECHANICAL SCHEDULES
12913153	M-602	MECHANICAL SCHEDULES
12913154	M-701	MECHANICAL CONTROLS
12913155	M-702	MECHANICAL CONTROLS
12913156	M-703	MECHANICAL CONTROLS
E	ELECTRICAL	
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12913159	ED102	FLOOR PLAN - EQUIPMENT CONNECTIONS DEMOLITION
12913160	ED103	FLOOR PLAN - LIGHTING DEMOLITION
12913161	E-101	FLOOR PLAN - POWER
12913162	E-102	FLOOR PLAN - EQUIPMENT CONNECTIONS
12913163	E-103	FLOOR PLAN - LIGHTING
12913164	E-401	ENLARGED FLOOR PLAN - POWER
12913165	E-501	ELECTRICAL DETAILS
12913166	E-502	ELECTRICAL DETAILS
12913167	E-503	ELECTRICAL DETAILS
12913168	E-601	ELECTRICAL SCHEDULES
12913169	E-602	ELECTRICAL SCHEDULES
12913170	E-603	ELECTRICAL SCHEDULES
12913171	E-604	ELECTRICAL SCHEDULES
12913172	E-701	ELECTRICAL RISER DIAGRAM
T	TELECOMMUNICATIONS	
12913173	T-001	TELECOMMUNICATIONS NOTES AND LEGENDS
12913174	TD101	FLOOR PLAN - TELECOMMUNICATIONS DEMOLITION
12913175	T-101	FLOOR PLAN - TELECOMMUNICATIONS
12913176	T-102	FLOOR PLAN - SECURITY INFRASTRUCTURE
12913177	T-401	ENLARGED FLOOR PLAN - TELECOMMUNICATIONS
12913178	T-501	TELECOMMUNICATIONS DETAILS
12913179	T-502	TELECOMMUNICATIONS DETAILS

NAVFAC NO	DWG NO	SHEET
12913180	T-503	TELECOMMUNICATIONS DETAILS

1.2.1 Reference Drawing[s]

The following reference drawings are intended only to show the original construction. Drawings are the property of the Government and shall not be used for any purpose other than that intended by the contract.

1174C
4866 SKETCH OF PROPOSED CONCRETE SIDEWALK AND CRUSHED STONE PARKING AREA NEAR POST OFFICE
1029 PLANTING PLAN
1093 POST OFFICE NEW PARTITIONS, COUNTER, ETC
3877 AIR CONDITION OF POSTAL OFFICERS OFFICE
6885 BUILDING 153 FLOOR PLAN
2193 PROPOSED POST OFFICE PARKING AREA
2243 PROPOSED POST OFFICE PARKING AREA
3689 AIR CONDITION OF STATION POST OFFICE
219696 PLANS & ELEVATIONS
219697 DETAILS
219698 TYPICAL DETAILS
219699 TYPICAL DETAILS
219702 PLANS & ELEVATIONS ELEC. HEAT. PLUMBING
300862 WATER AND SANITARY SEWER
301104 SITE PLAN POST OFFICE
301120 REVISION SHEET
344872 PLANS & SECTION
344873 ELEVATIONS & STRUCTURAL DETAILS
344874 EXTERIOR & INTERIOR DETAILS
344875 PLUMBING HEATING AND ELECTRIC
428058 HEATING
62617 PLANS AND DETAILS
3823 LOCATION PLAN
4959 EXTERIOR PAINTING OF VARIOUS BUILDINGS
4023699 VICINITY, LOCATION MAP, INDEX, AND LEGEND
4023700 STATION MAP, INDEX TO BUILDINGS, LOCATION OF WORK
4023718 INSTALL HEATING SYSTEM CONTROLS
4027233 LOCATION MAP
4027241 REPLACEMENT OF CONDENSATE PIPING
4027253 REPLACEMENT OF CONDENSATE PIPING
4038285 SECTIONS & DETAILS
4043443 PLANS & DETAILS
4046850 INDEX, LEGENDS, GEN NOTES & VICINITY MAP
4046879 ENERGY MONITORING & CONTROL SYSTEM
4087821 PLANS & SCHEDULE
4087822 PLAN & ELEVATIONS
4087823 DETAILS
4087830 INDEX TO DRAWINGS
4087833 DEMOLITION
4087894 DEMOLITION
4087836 NEW WORK
4087839 DETAILS & SCHEDULES
4087869 FLOOR PLAN
4094433 COVER SHEET

NAVFAC NO	DWG NO	SHEET
4094434	LOCATION MAP	
4094435	EXISTING WINDOW TYPES	
4094436	SOLAR SCREEN TYPES - DETAIL	
4094437	WINDOWS AND SOLAR SCREENS SCHEDULE	
4094438	WINDOWS AND SOLAR SCREENS SCHEDULE	
4115573	COVER & TITLE SHEET	
4115575	STRUCTURAL & MECHANICAL MODIFICATIONS TO B153	
4115580	ELECTRICAL MODIFICATIONS B153	
4131438	FLOOR PLAN & DETAILS	
4134097	FIRE ALARM SYSTEM	
4232079	REMOTE CYCLING OF WINDOW A/C UNITS	
4292821	TITLE SHEET	
4292822	ROOF PLAN	
4292823	BUILDING ELEVATIONS	
4292824	DETAILS	
004316660	TITLE SHEET	
004316661	MECHANICAL	
004316662	DEMOLITION - MECHANICAL	
004316663	RENOVATION - MECHANICAL	
004316664	RENOVATION DETAILS	
004316665	LEGEND AND SITE PLAN	
004316666	ELECTRICAL DEMOLITION PLAN	
004316667	ELECTRICAL RENOVATION PLAN, RISERS, AND SCHEDULES	
4343469	SITE PLANS AND ASPHALT PAVEMENT QUANTITIES	
4343474	COVER SHEET	
4343475	FLOOR PLAN - DEMOLITION	
4343476	ELEVATIONS - EXISTING	
4343477	ELEVATIONS - DEMOLITION	
4343478	ELEVATIONS - CONSTRUCTION	
4343479	WINDOW SCHEDULE AND ELEVATION	
4343480	DETAILS	
4367248	RADIO CONTROLLED RECEIVER SWITCHING SCHEDULES	
4524899	NEW WORK DRAWING NOTES	
12830002	MECHANICAL DEMOLITION PLAN	
12830003	MECHANICAL NEW WORK PLAN	

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12913149	M-503	MECHANICAL DETAILS
12913150	M-504	MECHANICAL DETAILS
12913151	M-505	MECHANICAL DETAILS
12913152	M-601	MECHANICAL SCHEDULES
12913153	M-602	MECHANICAL SCHEDULES
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12913163	E-103	FLOOR PLAN - LIGHTING
12913164	E-401	ENLARGED FLOOR PLAN - POWER
12913165	E-501	ELECTRICAL DETAILS
12913166	E-502	ELECTRICAL DETAILS
12913167	E-503	ELECTRICAL DETAILS
12913168	E-601	ELECTRICAL SCHEDULES
12913169	E-602	ELECTRICAL SCHEDULES
12913170	E-603	ELECTRICAL SCHEDULES
12913171	E-604	ELECTRICAL SCHEDULES
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12913178	T-501	TELECOMMUNICATIONS DETAILS
12913179	T-502	TELECOMMUNICATIONS DETAILS
12913180	T-503	TELECOMMUNICATIONS DETAILS

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SECTION 01 11 00

SUMMARY OF WORK
02/24

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes renovating B3918 to accommodate the MCAS Cherry Point Post Office and demolishing Building 153 and incidental related work.

1.1.2 Location

The work is located at MCAS Cherry Point, approximately as indicated. The exact location will be shown by the Contracting Officer.

1.2 OCCUPANCY OF PREMISES

Building(s) will be occupied during performance of work under this Contract. Occupancy notifications will be posted in a prominent location in the work area.

Before work is started, arrange with the Contracting Officer a sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways.

1.3 EXISTING WORK

Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.

Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work must be in a condition equal to or better than that which existed before new work started.

1.4 LOCATION OF UNDERGROUND UTILITIES

Obtain digging permits prior to start of excavation, and comply with Installation requirements for locating and marking underground utilities. Contact local utility locating service a minimum of 48 hours prior to excavating, to mark utilities, and within sufficient time required if work occurs on a Monday or after a Holiday. Verify existing utility locations indicated on contract drawings, within area of work.

Identify and mark all other utilities not managed and located by the local utility companies. Scan the construction site with Ground Penetrating Radar (GPR), electromagnetic, or sonic equipment, and mark the surface of the ground or paved surface where existing underground utilities are discovered. Verify the elevations of existing piping, utilities,and any type of underground obstruction not indicated, or specified to be removed, that is 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.

1.4.1 Notification Prior to Excavation

Notify the Contracting Officer at least 15 days prior to starting excavation work.

1.5 NAVY AND MARINE CORPS INTRANET (NMCI) COORDINATION REQUIREMENTS

1.5.1 NMCI Contractor Access

Allow the NMCI Contractor access to the facility towards the end of construction (finishes 90 percent complete, rough-in 100 percent complete, Inside Plant (ISP)/Outside Plant (OSP) infrastructure in place) to provide equipment in the telecommunications rooms and make final connections. Coordinate efforts with the NMCI Contractor to facilitate joint use of building spaces during the final phases of construction. After the Contracting Officer has facilitated coordination meetings between the two contractors, within one week, incorporate the effort of additional coordination with the NMCI Contractor into the construction schedule to demonstrate a plan for maintaining the contract duration.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS
11/22, CHG 3: 08/24

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contact Personnel

1.2 SPECIAL SCHEDULING REQUIREMENTS

a. Building 3918 must be ready for operation as approved by Contracting Officer before work is started on the demolition of Building 153 which would interfere with normal operation.

b. Have materials, equipment, and personnel required to perform the work at the site prior to the commencement of the work.

c. Building 3918 will remain in operation during the entire construction period. The Contractor must conduct his operations so as to cause the least possible interference with normal operations of the activity.

d. Permission to interrupt any Activity roads, railroads, or utility service must be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

f. The work under this contract requires special attention to the scheduling and conduct of the work in connection with existing operations. Identify on the construction schedule each factor which constitutes a potential interruption to operations.

The following conditions apply:

(1) Construction activities in Alcohol Storage 101 and Beer Cave 102 must be complete and accepted by the Contracting Officer before construction activities commence in other parts of Building 3918.

(2) Limit noisy construction activities including but not limited to jackhammers and power saws to before 10:00 am so that they do not disturb normal operations.

1.3 CONTRACTOR ACCESS AND USE OF PREMISES

1.3.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic, and security regulations. Keep within the limits of the work and avenues of ingress and egress. Wear appropriate personal protective equipment (PPE) in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Ensure all Contractor equipment,

including delivery vehicles, is clearly identified with their company name.

1.3.1.1 Subcontractors and Personnel Contacts

Provide a list of contact personnel of the Contractor and subcontractors, including addresses and telephone numbers, for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.3.1.2 Installation Access

Obtain access to Navy installations through participation in the Defense Biometrics Identification System (DBIDS). Requirements for Contractor employee registration, and transition for employees currently under Navy Commercial Access Control System (NCACS), are available at https://www.cnic.navy.mil/Operations-and-Management/Base-Support/DBIDS/. No fees are associated with obtaining a DBIDS credential.

Participation in the DBIDS is not mandatory, and Contractor personnel may apply for One-Day Passes at the Base Visitor Control Office to access an installation.

1.3.1.2.1 Registration for DBIDS

Registration for DBIDS is available at https://www.cnic.navy.mil/Operations-and-Management/Base-Support/DBIDS/. Procedure includes:

a. Present a letter or official award document (i.e. DD Form 1155 or SF 1442) from the Contracting Officer, that provides the purpose for access, to the base Visitor Control Center representative.

b. Present valid identification, such as a passport or Real ID Act-compliant state driver's license.

c. Provide completed SECNAV FORM 5512/1 to the base Visitor Control Center representative to obtain a background check. This form is available for download at https://www.cnic.navy.mil/Operations-and-Management/Base-Support/DBIDS/.

d. Upon successful completion of the background check, the Government will complete the DBIDS enrollment process, which includes Contractor employee photo, fingerprints, base restriction, and several other assessments.

e. Upon successful completion of the enrollment process, the Contractor employee will be issued a DBIDS credential, and will be allowed to proceed to worksite.

1.3.1.2.2 DBIDS Eligibility Requirements

Throughout the length of the contract, the Contractor employee must continue to meet background screen standards. Periodic background screenings are conducted to verify continued DBIDS participation and installation access privileges. DBIDS access privileges will be immediately suspended or revoked if at any time a Contractor employee becomes ineligible.

An adjudication process may be initiated when a background screen failure

results in disqualification from participation in the DBIDS, and Contractor employee does not agree with the reason for disqualification. The Government is the final authority.

1.3.1.2.3 DBIDS Notification Requirements

a. Immediately report instances of lost or stolen badges to the Contracting Officer.

b. Immediately collect DBIDS credentials and notify the Contracting Officer in writing under the following circumstances:

(1) An employee has departed the company without having properly returned or surrendered their DBIDS credentials.

(2) There is a reasonable basis to conclude that an employee, or former employee, might pose a risk, compromise, or threat to the safety or security of the Installation or anyone therein.

1.3.1.2.4 One-Day Passes

Personnel applying for One-Day passes at the Base Visitor Control Office are subject to daily mandatory vehicle inspection, and will have limited access to the installation. The Government is not responsible for any cost or lost time associated with obtaining daily passes or added vehicle inspections incurred by non-participants in the DBIDS.

1.3.1.3 No Smoking Policy

Smoking is prohibited within and outside of all buildings on installation, 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 will identify designated smoking areas.

1.3.2 Working Hours

Regular working hours will consist of an 8 1/2 hour period , between 7:00 a.m. and 3:30 p.m., Monday through Friday , , excluding Government holidays.

1.3.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number, and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work must be lighted in a manner approved by the Contracting Officer. Make utility cutovers after normal working hours or on Saturdays, Sundays, and Government holidays unless directed otherwise.

1.3.4 Occupied Building

The Contractor shall be working in an existing building which is occupied.

The existing buildings and their contents must be kept secure at all times. Provide temporary closures as required to maintain security as directed by the Contracting Officer.

Provide dust covers or protective enclosures to protect existing work that remains, and Government material located in the building during the construction period.

Relocate movable furniture as required to perform the work, protect the furniture, and replace the furniture in its original location upon completion of the work. Leave attached equipment in place, and protect it against damage, or temporarily disconnect, relocate, protect, and reinstall it at the completion of the work.

The Government will remove other Government property in the areas of the building scheduled to receive work.

1.3.5 Utility Cutovers and Interruptions

a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in paragraph WORK OUTSIDE REGULAR HOURS.

b. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.

c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm, compressed air, and fire protection are considered utility cutovers pursuant to the paragraph WORK OUTSIDE REGULAR HOURS.

d. Operation of Station Utilities: The Contractor must not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor must notify the Contracting Officer giving reasonable advance notice when such operation is required.

e. Connection to Existing Sanitary Sewer Line: Provide positive verification that the existing line conveys sanitary sewer; verify line is not incorrectly connected to a storm drain. Obtain Installation's Sanitary Sewer Connection Permit 2 weeks prior to connection .

1.4 SECURITY REQUIREMENTS

Contract Clause FAR 52.204-2 Security Requirements and Alternate II and the following apply:

1.4.1 MCAS Cherry Point Regulations

No employee or representative of the contractor will be admitted to the work site without an Identification Badge or is specifically authorized admittance to the work site by the FEAD, Facilities Engineering & Acquisition Division.

IMPORTANT NOTE: FEAD personnel (Construction Managers,

Engineers/Architects, Engineering Technicians, Contract Specialists, or Contract Surveillance Representatives) will not receive, process, re-transmit, or otherwise handle IN ANY WAY Personally Identifiable Information (PII) related to the badging process. Do NOT forward any of this information to the FEAD.

1.4.2 Contractor Access to MCAS Cherry Point and Outlying Areas

1. Documentation requirements for granting access to MCAS Cherry Point for commercial and contract employers and employees. This document is an aid in meeting ASO 5560.6B requirements and is not a substitute for the order.

2. The Pass & Identification Office at Building 251 will issue credentials to authorized contractors. Sub-Contractors and suppliers must coordinate through the Prime-Contractor.

3. Criminal Activity. In accordance with ASO 5560.6B, the below list of criminal activities within an applicant's record are considered not in the best interest of the Marine Corps and will be grounds for automatic denial of access aboard the Installation:

a. Conviction for espionage, sabotage, sedition, treason, terrorism, armed robbery, or murder.

b. Felony conviction for a firearms or explosives violation, regardless of the date of conviction.

c. Conviction of crimes encompassing sexual assault or rape.

d. Conviction of crimes encompassing child molestation, or the possession or production of child pornography.

e. Conviction of trafficking in persons.

f. Conviction of drug possession with intent to sell or distribute.

g. Convicted of three or more misdemeanor violations, or attempted violations, within the previous 10 years of the following offenses:

(1) Sex crime
(2) Assault
(3) Larceny
(4) Drugs
(5) Weapons

4. Persons requesting access to MCAS Cherry Point will be denied access based on the following:

a. The individual is a registered sex offender.

b. The individual has an active arrest warrant from Federal, State, local, or other civil law enforecement authorities, regardless of offense or violation.

c. The individual has a felony conviction within the last 10 years, regardless of the offense or violation.

d. The individual's name appears on any Federal or State agency watch

list for criminal behavior or terrorist activity.

e. The individual is debarred entry or access to a Marine Corps site, other DoD installations or facilities, or other Federal site or facility.

f. The individual engaged in acts or activities designed to overthrow the U.S. Government by force.

g. The individual is known to be or reasonably suspected of being a terrorist or belongs to an organization with known terrorism links/support.

h. The individual is identified in the National Crime Information Center (NCIC) known suspected terrorist (KST) file, or the Terrorist Screening Database (TSDB) report as known to be, or suspected of being, a terrorist or belonging to an organization with known links to terrorism or support of terrorist activity. If an individual is identified on the NCIC KST files or TSDB, the Provost Marshal's Office (PMO) will immediately call the NCIS Multiple Threat Alert Center (MTAC) for further coordination. The MTAC will coordinate with the Department of Justice or Federal Bureau of Investigation (FBI) and provide handling instructions to MCAS Cherry Point Police, Criminal Investigations Division (CID), or NCIS.

i. The individual is illegally present in the U.S.

j. The individual has knowingly submitted an employment questionnaire with false or fraudulent information.

k. The individual is a prisoner on a work-release program or currently on felony probation or parole.

l. The individual is pending any felony charge.

m. The individual has criminal arrest information that the site commander determines the person presents a threat to good order, discipline, or health and safety on the Marine Corps site.

n. Any reason the Installation Commander deems reasonable for good order and discipline.

1.4.3 Staging Area

As indicated on the plans, the Contractor staging area will be (Construction Manager to coordinate). Amount of material on site shall be kept to a minimum and shall only be material that is pertinent to the work currently being performed. All stockpiling of equipment and materials shall be closely coordinated with the Government and shall not disrupt activities at the site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES
11/20, CHG 4: 08/24

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. ARMY CORPS OF ENGINEERS (USACE)

EP 1110-1-8	(2021) Engineering and Design -- Construction Equipment Ownership and Operating Expense Schedule

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Schedule of Prices

1.3 SCHEDULE OF PRICES

1.3.1 Data Required

Schedule of Prices must have cost summarized and totals provided for each construction category. Provide a detailed breakdown of the Contract price, giving quantities for each of the various kinds of work, unit prices, and extended prices. Indirect activities (e.g., meetings, presentations, submittals, surveys, haul road or storage yard maintenance, dust control, security) will not be cost loaded. Evenly distribute the costs across the associated construction activities. Contractor overhead and profit including salaries for field office personnel, if applicable, must be proportionately spread over all pay items and not included as individual pay items.

1.3.2 Payment Schedule Instructions

Payments will not be made until the Schedule of Prices has been submitted to and accepted by the Contracting Officer.

Additionally, the Schedule of Prices must be separated as follows:

a. Primary Facilities Cost Breakdown:

Defined as work on the primary facilities out to the 5 foot line. Work out to the 5 foot line includes construction encompassed within a theoretical line 5 foot from the face of exterior walls and includes attendant construction, such as pad mounted HVAC cooling equipment, cooling towers, and transformers placed beyond the 5 foot line.

b. Supporting Facilities Cost Breakdown:

Defined as site work, including incidental work, outside the 5 foot line.

1.3.3 Schedule Requirements for HVAC TAB

The field work requirements in Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING FOR HVAC must be broken down in the Schedule of Prices and in the Construction Progress Documentation by separate line items which reflect measurable deliverables. The value for each pay item listed below will be established on a case by case basis for each Contract. The line items are as follows:

a. Approval of Design Review Report: The TABS Agency is required to conduct a review of the project plans and specifications to identify any feature, or the lack thereof, that would preclude successful testing and balancing of the project HVAC systems. Submit the resulting findings to the Government to allow correction of the design. The progress payment will not be issued until the report is reviewed and approved.

b. Approval of the pre-field engineering report: The TABS Agency submits a report which outlines the scope of field work. The report must contain details of what systems will be tested, procedures to be used, sample report forms for reporting test results, and a quality control checklist of work items that must be completed before TABS field work commences.

c. Season I field work: Incremental payments are issued as the TABS field work progresses. The TABS Agency mobilizes to the project site and executes the field work as outlined in the pre-field engineering report. The HVAC water and air systems are balanced and operational data must be collected for one seasonal condition (either summer or winter depending on project timing).

d. Approval of Season I report: On completion of the Season I field work, the data is compiled into a report and submitted to the Government. The report is reviewed, and approved, after ensuring compliance with the pre-field engineering report scope of work.

e. Completion of Season I field QA check: Contract QC and Government representatives meet the TABS Agency at the jobsite to retest portions of the systems reported in the Season I report. The purpose of these tests are to validate the accuracy and completeness of the previously submitted Season I report.

f. Approval of Season II report: The TABS Agency completes all Season II field work, which is normally comprised mainly of taking heat transfer temperature readings, in the season opposite of that under which Season I performance data was compiled. Compile this data into a report and submit to the Government. On completion of submittal review to ensure compliance with the pre-field engineering report scope, progress payment is issued. Progress payment is less than that issued for the Season I report since most of the water and air balancing work effort is completed under Season I.

1.4 CONTRACT MODIFICATIONS

In conjunction with the Contract Clause DFARS 252.236-7000 Modification Proposals-Price Breakdown, and where actual ownership and operating costs of construction equipment cannot be determined from Contractor accounting records, base equipment use rates upon the applicable provisions of the EP 1110-1-8.

1.5 CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT

1.5.1 Content of Invoice

Requests for payment will be processed in accordance with the Contract Clause FAR 52.232-27 Prompt Payment for Construction Contracts and FAR 52.232-5 Payments Under Fixed-Price Construction Contracts. Invoices not completed in accordance with contract requirements will be returned to the Contractor for correction of the deficiencies. Include the documents listed below in the requests for payment.

a. The Contractor's invoice, on NAVFAC Form 7300/30 furnished by the Government, showing in summary form, the basis for arriving at the amount of the invoice. Form 7300/30 must include certification by Quality Control (QC) Manager as required by the Contract.

b. The Estimate for Voucher/Contract Performance Statement on NAVFAC Form 4330/54 furnished by the Government. Use NAVFAC Form 4330, unless otherwise directed by the Contracting Officer, on NAVFAC Contracts when a Monthly Estimate for Voucher is required.

c. Contractor's Monthly Estimate for Voucher and Contractors Certification (NAVFAC Form 4330) with Subcontractor and supplier payment certification. Other documents, including but not limited to, that need to be received prior to processing payment include the following submittals as required. These items are still required monthly even when a pay voucher is not submitted.

d. Monthly Work-hour report.

e. Updated Construction Progress Schedule and tabular reports required by the contract.

f. Contractor Safety Self Evaluation Checklist.

g. Updated submittal register.

h. Solid Waste Disposal Report.

i. Certified payrolls.

j. Updated testing logs.

k. Other supporting documents as requested.

1.5.2 Submission of Invoices

If DFARS Clause 252.232-7006 Wide Area WorkFlow Payment Instructions is included in the Contract, provide the documents listed in above paragraph CONTENT OF INVOICE in their entirety as attachments in Wide Area Work Flow (WAWF) for each invoice submitted. The maximum size of each WAWF

attachment is two megabytes, but there are no limits on the number of attachments. If a document cannot be attached in WAWF due to system or size restriction, provide it as instructed by the Contracting Officer.

Monthly invoices and supporting forms for work performed through the anniversary award date of the Contract must be submitted to the Contracting Officer within 5 calendar days of the date of invoice. For example, if Contract award date is the 7th of the month, the date of each monthly invoice must be the 7th and the invoice must be submitted by the 12th of the month.

1.5.3 Final Invoice

a. A final invoice must be accompanied by the certification required by DFARS 252.247.7023 Transportation of Supplies by Sea, and the Contractor's Final Release. If the Contractor is incorporated, the Final Release must contain the corporate seal. An officer of the corporation must sign and the corporate secretary must certify the Final Release.

b. For final invoices being submitted via WAWF, the original Contractor's Final Release Form and required certification of Transportation of Supplies by Sea must be provided directly to the respective Contracting Officer prior to submission of the final invoice. Once receipt of the original Final Release Form and required certification of Transportation of Supplies by Sea has been confirmed by the Contracting Officer, the Contractor must then submit final invoice and attach a copy of the Final Release Form and required certification of Transportation of Supplies by Sea in WAWF.

c. Final invoices not accompanied by the Contractor's Final Release and required certification of Transportation of Supplies by Sea will be considered incomplete and will be returned to the Contractor.

1.6 PAYMENTS TO THE CONTRACTOR

Payments will be made on submission of itemized requests by the Contractor which comply with the requirements of this section, and will be subject to reduction for overpayments or increase for underpayments made on previous payments to the Contractor.

1.6.1 Obligation of Government Payments

The obligation of the Government to make payments required under the provisions of this Contract will, at the discretion of the Contracting Officer, be subject to reductions and suspensions permitted under the FAR and agency regulations including the following in accordance with FAR 32.103 Progress Payments Under Construction Contracts:

a. Reasonable deductions due to defects in material or workmanship;

b. Claims which the Government may have against the Contractor under or in connection with this Contract;

c. Unless otherwise adjusted, repayment to the Government upon demand for overpayments made to the Contractor; and

d. Failure to maintain accurate "as-built" or record drawings in accordance with FAR 52.236.21.

1.6.2 Payment for Onsite and Offsite Materials

Progress payments may be made to the Contractor for materials delivered on the site, for materials stored off construction sites, or materials that are in transit to the construction sites under the following conditions:

a. FAR 52.232-5(b) Payments Under Fixed Price Construction Contracts.

b. Materials delivered on the site, but not installed, and off-site materials to be considered for progress payment must be major high cost, long lead, special order, or specialty items, not susceptible to deterioration or physical damage in storage or in transit to the construction site. Examples of materials acceptable for payment consideration include, but are not limited to, structural steel, non-magnetic steel, non-magnetic aggregate, equipment, machinery, large pipe and fittings, precast/prestressed concrete products, plastic lumber (e.g., fender piles/curbs), and high-voltage electrical cable. Materials not acceptable for payment include consumable materials such as nails, fasteners, conduits, gypsum board, glass, insulation, and wall coverings.

c. Provide the Contracting Officer with documentation (e.g., Purchase Orders or Material Contracts) to justify payment for materials in advance of installation. When appropriate, include the Defense Priorities and Allocations System (DFAS) ratings (e.g., DX or DO) on purchase orders or material contracts to ensure timely delivery.

d. Materials to be considered for progress payment prior to installation must be specifically and separately identified in the Contractor's estimates of work submitted for the Contracting Officer's approval in accordance with Schedule of Prices requirement of this Contract. Requests for progress payment consideration for such items must be supported by documents establishing their value (e.g., paid invoices) and that the title requirements of the clause at FAR 52.232-5 Payments Under Fixed-Price Construction Contracts have been met.

e. Ensure materials are adequately insured and protected from theft and exposure. Provide insurance documentation (e.g., Builder's Risk Insurance) which covers the overall value of the materials to be paid in advance of installation.

f. Provide a written consent from the surety company with each payment request for offsite materials.

g. Materials to be considered for progress payments prior to installation must be stored either in Hawaii, Guam, Puerto Rico, or the Continental United States. Other locations are subject to written approval by the Contracting Officer.

h. Materials in transit to the job site or storage site are not acceptable for payment.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS
11/20, CHG 4: 08/24

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. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

View Location Map
Progress and Completion Pictures

1.3 VIEW LOCATION MAP

Submit, prior to or with the first digital photograph submittals, a sketch or drawing indicating the required photographic locations. Update as required if the locations are moved.

1.4 PROGRESS AND COMPLETION PICTURES

Photographically document site conditions prior to start of construction operations. Provide monthly, and within one month of the completion of work, digital photographs, 1600x1200x24 bit true color minimum resolution in JPEG file format showing the sequence and progress of work. Take a minimum of 20 digital photographs each week throughout the entire project from a minimum of ten different viewpoints selected by the Contractor unless otherwise directed by the Contracting Officer. Submit with the monthly invoice two sets of digital photographs, each set on a separate compact disc (CD) or data versatile disc (DVD), cumulative of all photos to date. 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. Also provide the view location sketch on the CD or DVD as a digital file. Include a date designator in file names. Photographs provided are for unrestricted use by the Government.

1.5 MINIMUM INSURANCE REQUIREMENTS

Provide the minimum insurance coverage required by FAR 28.307-2 Liability, during the entire period of performance under this contract. Provide other insurance coverage as required by North Carolina law.

1.6 SUPERVISION

1.6.1 Superintendent Qualifications

Provide project superintendent with a minimum of 10 years experience in construction with at least 5 of those years as a superintendent on projects similar in size and complexity. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance. The individual must be capable of interpreting a critical path schedule and construction drawings. The qualification requirements for the alternate superintendent are the same as for the project superintendent. The Contracting Officer may request proof of the superintendent's qualifications at any point in the project if the performance of the superintendent is in question.

For projects where the superintendent is permitted to also serve as the Quality Control (QC) Manager as established in Section01 45 00 QUALITY CONTROL, the superintendent must have qualifications in accordance with that section.

1.6.2 Minimum Communication Requirements

Have at least one qualified superintendent, or competent alternate, capable of reading, writing, and conversing fluently in the English language, on the job-site at all times during the performance of Contract work. In addition, if a QC representative is required on the Contract, then that individual must also have fluent English communication skills.

1.6.3 Duties

The project superintendent is primarily responsible for managing subcontractors and coordinating day-to-day production and schedule adherence on the project. The superintendent is required to attend Red Zone meetings, partnering meetings, and QC meetings. The superintendent or qualified alternative must be on-site at all times during the performance of this contract until the work is completed and accepted.

1.6.4 Non-Compliance Actions

The Project Superintendent is subject to removal by the Contracting Officer for non-compliance with requirements specified in the contract and for failure to manage the project to ensure timely completion. Furthermore, the Contracting Officer may 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 is acceptable as the subject of claim for extension of time for excess costs or damages by the Contractor.

1.7 PRECONSTRUCTION MEETING

Immediately after award, prior to commencing any work at the site, coordinate with the Contracting Officer a time and place to meet for the Preconstruction Meeting. The meeting must take place within 35 calendar days after award of the contract, but prior to commencement of any work at the site. The purpose of this meeting is to discuss and develop a mutual understanding of the administrative requirements of the Contract, including but not limited to: daily reporting, invoicing, value engineering, safety, base access, outage requests, hot work permits,

schedule requirements, QC, schedule of prices, shop drawings, submittals, cybersecurity, prosecution of the work, government acceptance, final inspections, and contract close-out. Contractor must present and discuss their basic approach to scheduling the construction work and any required phasing.

1.7.1 Attendees

Contractor attendees must include the Project Manager, Superintendent, Site Safety and Health Officer (SSHO), QC Manager, and major subcontractors.

1.8 FACILITY TURNOVER PLANNING MEETINGS (Red Zone Meetings)

Meet with the Government to identify strategies to ensure the project is carried to expeditious closure and turnover to the Client. Start planning the turnover process at the Pre-Construction Conference meeting with a discussion of the Red Zone process and convene at regularly scheduled NAVFAC Red Zone Meetings beginning at approximately 75 percent of project completion. Include the following in the facility Turnover effort:

1.8.1 Red Zone Checklist

a. Contracting Officer's Technical Representative (COTR) will provide the Contractor a copy of the Red Zone Checklist template.

b. Prior to 75 percent completion, modify the Red Zone Checklist template by adding or deleting critical activities applicable to the project and assign planned completion dates for each activity. Submit the modified Red Zone Checklist to the Contracting Officer. The Contracting Officer may request additional activities be added to the Red Zone Checklist at any time as necessary.

1.8.2 Meetings

a. Conduct regular Red Zone Meetings beginning at approximately 75 percent project completion, or three to six months prior to Beneficial Occupancy Date (BOD), whichever comes first.

b. The Contracting Officer will establish the frequency of the meetings, which is expected to increase as the project completion draws nearer. At the beginning, Red Zone meetings may be every two weeks then increase to weekly towards the final month of the project.

c. Using the Red Zone Checklist as a Plan of Action and Milestones (POAM) and basis for discussion, review upcoming critical activities and strategies to ensure work is completed on time.

d. During the Red Zone Meetings, discuss with the COTR any upcoming activities that require Government involvement.

e. Maintain the Red Zone Checklist by documenting the actual completion dates as work is completed and update the Red Zone Checklist with revised planned completion dates as necessary to match progress. Distribute copies of the current Red Zone Checklist to attendees at each Red Zone Meeting.

1.9 PARTNERING

Host the partnering session within 45 calendar days of contract award. To most effectively accomplish this Contract, the Contractor and Government must form a cohesive partnership with the common goal of drawing on the strength of each organization in an effort to achieve a successful project without safety mishaps, conforming to the Contract, within budget, and on schedule. The partnering team must consist of personnel from both the Government and Contractor including project level and corporate level leadership positions. Key Personnel from the supported command, end user, PWD, FEAD, Contractor, key subcontractors, and the Designer of Record are required to participate in the Partnering process.

1.9.1 Team-Led (Informal) Partnering

a. The Contracting Officer will coordinate the initial Team-Led (Informal) Partnering Session with key personnel of the project team, including Contractor and Government personnel. The Partnering Session will be co-led by the Government Construction Manager and Contractor's Project Manager.

b. The Initial Team-led Partnering session may be held concurrently with the Pre-Construction meeting. Partnering sessions will be held at a location mutually agreed to by the Contracting Officer and the Contractor, typically at a conference room on-base or at the Contractor's temporary trailer.

c. The Initial Team-Led Partnering Session will be conducted and facilitated using electronic media (a video and accompanying forms) provided by Contracting Officer.

d. The Partners will determine the frequency of the follow-on sessions.

e. Participants will bear their own costs for meals, lodging, and transportation associated with Partnering.

1.10 MOBILIZATION

Contractor shall mobilize to the jobsite within 60 calendar days after contract award . Mobilize is defined as having equipment AND having a physical presence of at least one person from the contractor's team on the jobsite.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 31 23.13 20

ELECTRONIC CONSTRUCTION AND FACILITY SUPPORT CONTRACT MANAGEMENT SYSTEM (eCMS)
08/23

PART 1 GENERAL

1.1 CONTRACT ADMINISTRATION

Utilize the Naval Facilities Engineering Systems Command's (NAVFAC's) Electronic Construction and Facility Support Contract Management System (eCMS) for the transfer, sharing, and management of electronic technical submittals and documents. The web-based eCMS is the designated means of transferring technical documents between the Contractor and the Government. Paper media or email submission, including originals or copies, of the documents are not permitted unless identified within the contract.

All government contracting specialist/officer, legal, and command communications will remain the same.

1.2 USER PRIVILEGES

The Contractor's key staff may be provided access to eCMS. Contact the COR for eCMS account access. Project roles and system roles will be established to control each user's menu, application, and software privileges, including the ability to create, edit, or delete objects. Additional project roles may be assigned for workflow. The COR makes the final decision on roles for the project. User's ability to view and edit documents may be lowered at the discretion of the COR.

Only one eCMS user account is required regardless of the number of user's projects. Notify the COR within seven calendar days if a contractor user is no longer associated with company or project so they can remove them from any open record and inactivate them from the project.

1.2.1 eCMS Subcontractor Users

If the contractor's user is a subcontractor, the subcontractor must be registered under the name of their company and email. For example, it is common for contractors to contract QC Managers. The QC Manager's account should be under their company's name and email reducing the number of eCMS accounts required.

1.2.2 Users with Multiple Roles

Users may have multiple roles associated with their account within eCMS. Roles are used in workflow. When a user is added to the project, they will be assigned the default role when the user was created. Contact the COR to change or add roles to the user for the project.

1.2.3 Loss of Privilege

Users may lose privilege to access eCMS at the discretion of the COR and/or Contracting Officer. The eCMS is a collaborative system that allows flexibility of use and does not restrict all inappropriate user actions. User activities are logged into eCMS in visible and background

data collection. Users found to use eCMS in an inappropriate action may have their eCMS access revoked. Examples include, but are not limited to, fraudulent representations, sharing user accounts with others, and changing approved records without the consent of the COR. Depending on the severity of the infraction, the users can lose eCMS access for a period of time, permanently for the project, or lose eCMS access for any project. The contractor may appeal the suspension in writing to the Contracting Officer within 14 calendar days of notice. The appeal must identify the infraction, supporting information, and steps to ensure the infraction will not happen in the future.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contractor's Personnel

For Division 1 government-approved Pre-Construction submittals, combine into a single Pre-Construction Submittal Package, annotated with SD Type of SD-01. Pre-Construction submittal package approval date will be used as a KPI.

1.4 SYSTEM REQUIREMENTS AND CONNECTIVITY

1.4.1 General

NAVFAC eCMS requires a web-browser (platform-neutral) and Internet connection. For best results, recommend using browser in InPrivate/Incognito mode; Internet speeds greater than 40mbps when uploading files, computers with high RAM and Solid State Drives, "White List" eCMS website, Zip or Split files for better uploading. Non-NAVFAC Users are not to use VPN when using eCMS per NAVFAC IT.

The use of eCMS is required by the Contractor and all associated costs and time necessary to utilize eCMS will be borne by the Contractor with no allowance for time extensions and at no additional cost to the government.

1.4.2 Contractor Personnel List

Within 20 calendar days of contract award, provide to the Contracting Officer a list of Contractor's personnel who will have the responsibility for the transfer, sharing, and management of electronic submittals, RFIs, daily reports, and other files and will require access to the eCMS. Project personnel roles which must be filled as applicable in the eCMS include, at a minimum, the Contractor's Project Manager (KTR-PM), Superintendent (KTSUPT), QC Manager (KTR-QC), Principal (KTR-PRIN), and Site Safety and Health Officer (KTR-SSHO). Notify the COR immediately of any personnel changes to the project. The Contracting Officer reserves the right to perform a security check on all potential users.

Provide the following information:

Company Name
Name (First, Last)
Email Address
Project Role (CQM, SSHO, Superintendent, CM, PM, Principal)

Existing or New eCMS User

1.5 SECURITY CLASSIFICATION

In accordance with Department of Navy guidance, all military construction contract data are unclassified, unless specified otherwise by a properly designated Original Classification Authority (OCA) and in accordance with an established Security Classification Guide (SCG). Refer to the project's OCA when questions arise about the proper classification of information.

In conformance with the Freedom of Information Act (FOIA), DoD INSTRUCTION 5200.48 CONTROLLED UNCLASSIFIED INFORMATION (CUI), and DoD requirements, any unclassified project documentation uploaded into the eCMS must be designated either "U - UNCLASSIFIED" (U) or "CUI - CONTROLLED UNCLASSIFIED INFORMATION" (CUI). NAVFAC eCMS must only be used for the transaction of unclassified information associated with construction projects. Controlled Unclassified Identification (CUI) documents may be loaded into eCMS with the appropriate markings.

1.5.1 Markings on CUI Documents

Contractor's proprietary information, or documents determined by the originator in accordance with CUI guidance, should be marked CUI. Proprietary information not marked CUI can be released under the Freedom of Information Act (FOIA). Apply the appropriate markings before any document is uploaded into eCMS. Markings are not required on Unclassified (U) documents.

1.6 eCMS UTILIZATION

Establish, maintain, and update data and documentation in the eCMS throughout the duration of the contract. Utilize eCMS to transfer all submittals, RFIs, daily reports, and other files required by contract to be forwarded to the government.

Full eCMS use is required. All Submittals/Information to use eCMS Modules including, but not limited to, RFIs, Daily Reports, Meeting Minutes, Communications, Issues, Punch Lists, Checklists, and Flysheets, unless otherwise directed by the COR or Contracting Officer.

1.6.1 Restricted Information

Personally Identifiable Information (PII) transmittal such as credit card, driver's license, passport, social security, and payroll number are not permitted in eCMS. Name, address, and email are permitted. Pre-negotiation information such as cost estimates that require formal negotiations are not allowed. For example, proposed changes over the SAP level of $250k require formal negotiations. Cost estimates for LEAN, ULTRA LEAN, and Design Changes under the SAP level are at the discretion of the COR's or Contract Specialist/Officer's direction. The eCMS must only be used for the transaction of unclassified information associated with construction projects. Controlled Unclassified Identification (CUI) documents may be loaded into eCMS with the appropriate markings. Uploading of files directly into the Documents folder is not allowed. All documents must be uploaded using an eCMS module.

1.6.2 Naming Convention for Files

Titles of files uploaded are to be descriptive of the purpose and content of the file. For example RFI_ROOF_Leak.doc or for submittals, SUB_LIGHT_FIXTURE.pdf. Titles of file to be uploaded must only contain uppercase letters, lowercase letters, numbers, hyphens (-), underscores (_), and periods (.). Use of any other characters is not allowed and may create an error. When practicable, adding the record number to the title is desired. For example RFI_XYZ12345_ROOF_Leak.doc. Uploading files with the same title will create a new revision in eCMS. Original revision is Rev 0, the first revision is Rev 1. Uploaded files are to use the default file location regardless of the module used unless directed by the COR.

Table 1 also identifies which eCMS application is to be used in the transmittal of data (these are subject to change based on the latest software configuration).

Table 1 - Project Documentation Types

SUBJECT/NAME	REMARKS	eCMS APPLICATION
As-Built Drawings	Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager	Submittals
Building Information Modeling (BIM)	Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager	Submittals
Construction Permits	Refer to rules of the issuing activity, state or jurisdiction	Submittals
Construction Schedules (Activities and Milestones)		Submittals
Construction Schedules		Submittals
Construction Schedules (3-Week Look ahead)	Import the schedule file into the scheduling application, and select "Approve" to establish a new schedule baseline	Meeting Minutes
DD 1354 Transfer of Real Property	When applicable, required for final billing.	Submittals

SUBJECT/NAME	REMARKS	eCMS APPLICATION
Daily Production Reports	Provide weather conditions, crew size, man-hours, equipment, and materials information	Daily Report
Daily Quality Control (QC) Reports	Provide QC Phase, Definable Features of Work Identify visitors	Daily Report
Designs and Specifications	Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager	Submittals
Environmental Notice of Violation (NOV), Corrective Action Plan	Refer to rules of the issuing activity, state, or jurisdiction	Submittals
Environmental Protection Plan (EPP)		Submittals
Invoice (Supporting Documentation)	Applies to supporting documentation only. Invoices are submitted in Wide-Area Workflow (WAWF)	Submittals
Jobsite Documentation, Bulletin Board, Labor Laws, SDS	Redact any PII information when loaded into eCMS	Submittals
Meeting Minutes		Meeting Minutes
Modification Documents	Provide final modification documents for the project. Upload into Modifications RFPs folder	Communications
Operations & Maintenance Support Information (OMSI/eOMSI), Facility Data Worksheet	1. Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager 2. Design reviews will be performed in existing "Dr Checks"	Submittals
Photographs	Subject to base/installation restrictions	Submittals

SUBJECT/NAME	REMARKS	eCMS APPLICATION
QCM Initial Phase Checklists		Meeting Minutes or Checklists
QCM Preparatory Phase Checklists		Meeting Minutes or Checklists
Quality Control Plans		Submittals
QC Certifications		Submittals
QC Punch List		Punch Lists
Red-Zone Checklist		Punch List or Checklists
Rework Items List		Punch Lists
Request for Information (RFI) Post-Award		RFIs
Safety Plan		Submittals
Safety - Activity Hazard Analyses (AHA)		Submittals
Safety - Mishap Reports		Daily Report
Shop Drawings	Locations of sensitive areas must be labeled as either "Controlled Area" or "Restricted Area" and may be shown on unclassified documents with the approval from Site Security Manager	Submittals
Storm Water Pollution Prevention (Notice of Intent - Notice of Termination)	Refer to rules of the issuing activity, state or jurisdiction	Submittals
Submittals and Submittal Register		Submittals
Testing Plans, Logs, and Reports		Submittals

SUBJECT/NAME	REMARKS	eCMS APPLICATION
Training/Reference Materials		Submittals
Training Records (Personnel)	Redact any PII information if storing in eCMS	Submittals
Utility Outage/Tie-In Request/Approval		Submittals
Warranties/BOD Letter		Submittals
Quality Assurance Reports		Checklists (Government initiated)
Non-Compliance Notices		Non-Compliance Notices (Government initiated)
Other Government-prepared documents		GOV ONLY
Letters to government contracting, claims, REAs, and other Contracting Officer communications	eCMS is not the primary tool to use in Contracting Officer communications. eCMS can only store documents or letters after the submission to the Contracting Officer is made.	Communications
All Othere Documents	Refer to FOIA guidelines and contact the FOIA official to determine whether exemptions exist	As applicable

1.6.3 RFIs Module

Create contractor RFIs using eCMS RFIs module. The contractor must confirm the numbering convention with the COR if different than eCMS default.

If the government (GOV) response has "No" Cost or Schedule Impact, this reply is given with the expressed understanding that it does not constitute a basis for any change in the amount or time of subject contract. Information provided in this response does not authorize work not currently included in the contract. If GOV Response is "Yes" or "Potentially" then this response may require a change to the contract. If the contractor disagrees with the government's No Cost and/or No Schedule impact determination, the contractor has 14 calendar days to notify the COR and Contracting Officer in writing.

1.6.4 Submittals Module

Create contractor submittals using eCMS Submittals module. The contractor must confirm the numbering convention with the COR if different than eCMS default.

1.6.5 Submittal Packages Module

Create submittal packages using the eCMS Submittal Packages module in lieu of or in addition to Related Objects. Submittal Packages track completion of the packaged submittals and is used in NAVFAC HQ's KPIs.

1.6.6 Communications Module

Create communications using the eCMS Communications module. The Communications module is used to create or document communications that are not a part of other eCMS modules. Use of Communications module will memorialize information into an eCMS record file. The following are Types of Communications:

Email
Memo to File
Face to Face
Telephone
Web Collaboration
Photos
Other Documents
Other

Unless directed by the COR, upload documents or files that do not have a corresponding eCMS module. Choose "Photos" Type for Photos and "Other Documents" for all other documents.

1.6.7 Issues Module

Create or respond to issues using the eCMS Issues module. Respond to CPARS issues using the Issues module.

1.6.8 Meeting Minutes Module

Create or respond to Meeting Minutes using the eCMS Meetings module.

Document required contractual meetings. Dates of meetings are used in NAVFAC KPIs. Minimum meetings in eCMS include the following:

Post Award Kickoff (PAK)
Pre-construction (Pre Con)
Initial and Preparatory Three Phases of Control
Quality Control (QC)

1.6.9 Potential Change Items Module

Not used.

1.6.10 Daily Report Module

Create Daily Reports using the eCMS Daily Report Module. The contractor must confirm the numbering convention with the COR if different than eCMS default.

1.6.11 Punchlists Testing Logs (Legacy)

Punchlist Testing Logs is a legacy program that is being replaced by the Punch Lists Module. This module is to be used for reference of past projects. Use the Punch Lists Module for all future work.

1.6.12 Punch Lists Module

The eCMS Punch Lists module is useful more than just for Punchlists. The module includes the capability of batch editing, create items from Optical Character Recognition (OCR) plans, assign tasks, and track completion of individual items.

Create the following using the Punch Lists module:

Rework Items List
DFOW List
Punch-Out Inspection
Pre-Final Punchlist Inspection
Final Punchlist Inspection
Testing Logs

1.6.13 FWD UltraLean COAR RFP Module

Not Used.

1.6.14 Non-Compliance Notices (NCN) Module

Respond to Non-Compliance Notices listed in the Non-Compliance Notices module.

1.6.15 Checklists

Use Checklist listed in the contractor's eCMS menu and as directed by the COR. Checklists capture data and is used in dashboards and KPIs.

1.6.15.1 Partnering Team Health Survey Checklist

Contractor must use the eCMS checklist to document the partnering team health survey. Partnering Team Health Survey is in accordance with the Partnering Specification of this contract.

1.6.16 Flysheets

Use Flysheets listed in the contractor's eCMS menu, if available, and as directed by the COR. Flysheets allow the contractor to print out information from other systems and upload into eCMS. The eCMS will use OCR to capture the information as data. Flysheets capture data used in dashboards and KPIs.

1.6.17 eCMS Outage

In the case where eCMS is unavailable for 8 hours or more, paper or email may be used in the interim to maintain project schedule.

Once the system is operational, all final records are required to be recreated using the appropriate module. Subject/title of the record to include the type of record i.e., RFI/Submittal/Daily

Report/Communication/Other, the identification number(s), and the statement "Processed Outside of eCMS". Example, "RFI 001 Processed Outside of eCMS".

1.6.18 User Account Activity

NAVFAC eCMS captures user data and activities that are directly related to the user's account. The user agrees through the use of eCMS, their account activities will be captured and can be displayed on eCMS printed reports.

1.7 QUALITY ASSURANCE

Requested Government response dates on Submittals must be in accordance with the terms and conditions of the Contract unless previously agreed by the COR. Requesting response dates earlier than the required review and response time, without concurrence by the Government COR, may be cause for rejection.

Incomplete submittals will be rejected without further review and must be resubmitted. Required Government response dates for resubmittals must reflect the date of resubmittal, not the original submittal date.

All submittals and associated attachments must be transmitted to the Government via the COR. Transmittals are no longer required when using eCMS since approval status is tracked on the submittal. Transmittal forms can be attached to submittals if approved by the COR. Submittals requiring government approval are "Transmitted For" "Approval". Submittals for Information Only are "*Transmitted For" "Information Only" in the Submittal Module. Provide and sign the QC certification statement on the attachment per submittal specification section. When Submittal Packages are required, use eCMS Submittal Packages after creating individual submittals. Importing Submittals from the Submittal Register is optional. Contact the COR for the data conversion requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 32 16.00 20

SMALL PROJECT CONSTRUCTION PROGRESS SCHEDULES
08/18, CHG 1: 08/20

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Baseline Construction Schedule

SD-07 Certificates

Monthly Updates

1.2 PRE-CONSTRUCTION SCHEDULE REQUIREMENT

Prior to the start of work, prepare and submit to the Contracting Officer a Baseline Construction Schedule in the form of a Bar Chart Schedule in accordance with the terms in Contract Clause FAR 52.236-15 Schedules for Construction Contracts, except as modified in this contract. The approval of a Baseline Construction Schedule is a condition precedent to:

a. The Contractor starting demolition work or construction stage(s) of the contract.

b. Processing Contractor's invoice(s) for construction activities/items of work.

c. Review of any schedule updates.

Submittal of the Baseline Construction Schedule, and subsequent schedule updates, is understood to be the Contractor's certification that the submitted schedule meets the requirements of the Contract Documents, represents the Contractor's plan on how the work will be accomplished, and accurately reflects the work that has been accomplished and how it was sequenced (as-built logic).

1.3 SCHEDULE FORMAT

1.3.1 Bar Chart Schedule

The Bar Chart must, as a minimum, show work activities, submittals, Government review periods, material/equipment delivery, utility outages, on-site construction, inspection, testing, and closeout activities. The Bar Chart must be time scaled and generated using an electronic spreadsheet program.

1.3.2 Schedule Submittals and Procedures

Submit Schedules and updates in hard copy and on electronic media that is acceptable to the Contracting Officer. Submit an electronic back-up of

the project schedule in an import format compatible with the Government's scheduling program.

1.4 SCHEDULE MONTHLY UPDATES

Update the Construction Schedule at monthly intervals or when the schedule has been revised. Keep the updated schedule current, reflecting actual activity progress and plan for completing the remaining work. Submit copies of purchase orders and confirmation of delivery dates as directed by the Contracting Officer.

a. Narrative Report: Identify and justify the following:

(1) Progress made in each area of the project;

(2) Longest Path: Include printed copy on 11 by 17 inch paper, landscape setting;

(3) Date/time constraint(s), other than those required by the contract;

(4) Listing of changes made between the previous schedule and current updated schedule including: added or removed activities, original and remaining durations for activities that have not started, logic (sequence, constraint, lag/lead), milestones, planned sequence of operations, longest path, calendars or calendar assignments, and cost loading.

(5) Any decrease in previously reported activity Earned Amount;

(6) Pending items and status thereof, including permits, change orders, and time extensions;

(7) Status of Contract Completion Date and interim milestones;

(8) Current and anticipated delays (describe cause of delay and corrective actions(s) and mitigation measures to minimize);

(9) Description of current and future schedule problem areas.

For each entry in the narrative report, cite the respective Activity ID and Activity Name, the date and reason for the change, and description of the change.

1.5 3-WEEK LOOK AHEAD SCHEDULE

Prepare and issue a 3-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Construction Schedule. Key the work plans to activity numbers when a NAS is required and update each week to show the planned work for the current and following two-week period. Additionally, include upcoming outages, closures, preparatory meetings, and initial meetings. Identify critical path activities on the Three-Week Look Ahead Schedule. The detail work plans are to be bar chart type schedules, maintained separately from the Construction Schedule on an electronic spreadsheet program and printed on 8-1/2 by 11 inch sheets as directed by the Contracting Officer. Activities must not exceed 5 working days in duration and have sufficient level of detail to assign crews, tools and equipment required to complete the work. Deliver three hard copies and one electronic file of the 3-Week Look Ahead Schedule to the Contracting Officer no later than 8 a.m. each Monday, and review during

the weekly CQC Coordination or Production Meeting.

1.6 CORRESPONDENCE AND TEST REPORTS:

Correspondence (e.g., letters, Requests for Information (RFIs), e-mails, meeting minute items, Production and QC Daily Reports, material delivery tickets, photographs) must reference Schedule Activities that are being addressed. Test reports (e.g., concrete, soil compaction, weld, pressure) must reference Schedule Activities that are being addressed.

1.7 ADDITIONAL SCHEDULING REQUIREMENTS

Any references to additional scheduling requirements, including systems to be inspected, tested and commissioned, that are located throughout the remainder of the Contract Documents, are subject to all requirements of this section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 33 00

SUBMITTAL PROCEDURES
08/18, CHG 4: 02/21

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

SD-01 Preconstruction Submittals

Submittals that are required prior to or commencing with the start of work on site.

Preconstruction Submittals include schedules and a tabular list of locations, features, and 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
Baseline Construction Schedule
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 ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those that 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.

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

Report that 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 the 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 (SDS)concerning impedances, hazards, and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

Data provided by the manufacturer, or the system provider, including manufacturer's help and product line documentation, necessary to maintain and install equipment, for operating and maintenance use by facility personnel.

Data required by operating and maintenance personnel for the safe and efficient operation, maintenance, and repair of the item.

Data 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.

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.

1.1.2 Approving Authority

Office or designated person authorized to approve the submittal.

1.1.3 Work

As used in this section, on-site 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. In exception, excludes work to produce SD-01 submittals.

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following

in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittal Register

1.3 SUBMITTAL CLASSIFICATION

1.3.1 For Information Only

Submittals not requiring Government approval will be for information only. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are not considered to be "shop drawings."

1.3.2 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.

1.4 FORWARDING SUBMITTALS REQUIRING GOVERNMENT APPROVAL

As soon as practicable after award of contract, and before procurement or fabrication, forward to the Architect-Engineer: MBF Architects PA, 317-C Pollock St. New Bern NC 28560, submittals required in the technical sections of this specification, including shop drawings, product data and samples. In addition, forward a copy of the submittals to the Contracting Officer at Commander, NAVFAC Mid-Atlantic, FEAD Cherry Point (Construction Division), PSC Box 8006, Building 87, Cherry Point, North Carolina, 28533-0006.

Forward to the Commander, NAVFAC Mid-Atlantic, FEAD Cherry Point (Construction Division), PSC Box 8006, Building 87, Cherry Point, North Carolina, 28533-0006, submittals required in the General Requirements sections of this specification.

1.4.1 O&M Data

Submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

In the event the Contractor fails to deliver O&M data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the items to which such O&M data apply.

1.4.2 Submittals Reserved for NAVFAC Mid-Atlantic Approval

As an exception to the standard submittal procedure for Government Approval, submit the following to the Commander, NAVFAC Mid-Atlantic, 9742 Maryland Avenue, Building Z-140, Room 219, Norfolk, Virginia, 23511-3095:

b. Section 21 13 13 WET PIPE SPRINKLER SYSTEMS, FIRE PROTECTION: All fire protection system submittals

c. Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM,

ADDRESSABLE: All fire alarm system submittals

e. Section 01 91 00.15 20 TOTAL BUILDING COMMISSIONING: SD-06 Commissioning Plan, Certificate of Readiness, and Commissioning Report submittals

f. Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC: SD-06 field test report submittals

g Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS: SD-06 field test report submittals

h. Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING FOR MECHANICAL SYSTEMS: All submittals

1.5 PREPARATION

1.5.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels to the office of the approving authority using the transmittal form prescribed by the Contracting Officer. Include all information prescribed by the transmittal form and required in paragraph IDENTIFYING SUBMITTALS. Use the submittal transmittal forms to record actions regarding samples.

1.5.2 Identifying Submittals

The Contractor's QC Manager must prepare, review and stamp submittals, including those provided by a subcontractor, before submittal to the Government.

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. Dates 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 by which submittal is required

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

g. For 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 Submittal Format

1.5.3.1 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 certification 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.

1.5.3.2 Format for SD-02 Shop Drawings

Provide shop drawings not less than 8 1/2 by 11 inches nor more than 30 by 42 inches, 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.

Submit an electronic copy of drawings in PDF format.

1.5.3.2.1 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 four inches on the right-hand side of each sheet for the Government disposition stamp.

1.5.3.3 Format of SD-03 Product Data

Present product data submittals for each section. 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.

1.5.3.3.1 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 units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

1.5.3.3.2 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.

1.5.3.3.3 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.

1.5.3.4 Format of SD-04 Samples

1.5.3.4.1 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 2 by 3 inches: Built up to 8 1/2 by 11 inches.

c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. 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: 4 by 4 feet.

h. Sample Installation: 100 square feet.

1.5.3.4.2 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.

1.5.3.4.3 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.

1.5.3.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.5.3.6 Format of SD-06 Test Reports

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

1.5.3.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.5.3.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section. 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.

1.5.3.8.1 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.

1.5.3.9 Format of SD-09 Manufacturer's Field Reports

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

1.5.3.10 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.

1.5.3.11 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 certification 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 Source Drawings for Shop Drawings

1.5.4.1 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.

1.5.4.2 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).

1.5.5 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. 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.

E-mail electronic submittal documents smaller than 10MB to an e-mail address as directed by the Contracting Officer. Provide electronic documents over 10 MB on an optical disc or through an electronic file sharing system such as the DOD SAFE Web Application located at the following website: https://safe.apps.mil/.

1.6 QUANTITY OF SUBMITTALS

1.6.1 Number of SD-01 Preconstruction Submittal Copies

Unless otherwise specified, submit three sets of administrative submittals.

1.6.2 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.

1.7 INFORMATION ONLY SUBMITTALS

Submittals not requiring approval by the Government must be certified by the QC manager and submitted to the Contracting Officer for information-only. Provide information-only submittals to the Contracting Officer a minimum of 14 calendar days prior to the Preparatory Meeting for the associated Definable Feature of Work (DFOW). 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

A sample Project Submittal Register showing items of equipment and materials for when submittals are required by the specifications is provided at the end of this section.

1.8.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. 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.

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.

Column (f): Lists the approving authority for each submittal. 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 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"
"AN" - "Approved as noted"
"RR" - "Disapproved as submitted"; "Completed"
"NR" - "Not Reviewed"
"RA" - "Receipt Acknowledged"

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 of a variation submittal will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For variations that include design changes or some material or product substitutions, the Government may require an evaluation and analysis by a licensed professional engineer hired by the contractor.

Specifically point out variations from contract requirements in a transmittal letter. 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 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.

1.9.3 Review Schedule Extension

In addition to the normal submittal review period, a period of 10 working 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.

Contracting Officer review will be completed within 20 working days after the date of submission.

d. Except as specified otherwise, allow a review period, beginning with receipt by the approving authority, that includes at least 20 working days for submittals where the Contracting Officer is the approving authority. The period of review for submittals with Contracting Officer approval begins when the Government receives the submittal from the QC organization.

e. For submittals requiring review by a Government fire protection engineer, allow a review period, beginning when the Government receives the submittal from the QC organization, of 30 working days for return of the submittal to the Contractor.

1.10.1 Reviewing, Certifying, and Approving Authority

The QC Manager is responsible for reviewing all submittals and certifying that they are in compliance with contract requirements. The approving authority on submittals is the Contracting Officer unless otherwise specified.

1.10.2 Constraints

Conform to provisions of this section, unless explicitly stated otherwise for submittals listed or specified in this contract.

Submit complete submittals for each definable feature of the work. At the same time, submit components of definable features that are interrelated as a system.

When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, the submittal will be returned without review.

Approval of a separate material, product, or component does not imply approval of the assembly in which the item functions.

1.10.3 QC Organization Responsibilities

a. Review submittals for conformance with project design concepts and compliance with contract documents.

b. Process submittals based on the approving authority indicated.

(1) When the Contracting Officer is the approving authority or when variation has been proposed, forward the submittal to the Government, along with a certifying statement, or return the submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of the submittal determines the appropriate action.

c. Ensure that material is clearly legible.

d. Stamp each sheet of each submittal with a QC certifying statement, except that data submitted in a bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.

(1) When the approving authority is the Contracting Officer, the QC

organization will certify submittals forwarded to the Contracting Officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with Contract Number (_____) is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by Submittal Reviewer _____, Date _____
(Signature when applicable)

Certified by QC Manager _____, Date _____"
(Signature)

e. Sign the certifying statement. The QC organization member designated in the approved QC plan is the person signing certifying statements. The use of original ink for signatures is required. Stamped signatures are not acceptable.

f. Update the submittal register as submittal actions occur, and maintain the submittal register at the project site until final acceptance of all work by the Contracting Officer.

g. Retain a copy of approved submittals and approved samples at the project site.

h. For "S" submittals, provide a copy of the approved submittal to the Government Approving authority.

1.11 GOVERNMENT APPROVING AUTHORITY

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

a. Note the date on which the submittal was received from the QC manager.

b. Review submittals for approval within the 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 comments and markings appropriate for the action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. Three copies of the submittal will be retained by the Contracting Officer and four copies of the submittal will be returned to the Contractor.

1.11.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.

b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered

provided that the Contractor takes no exception to the corrections.

c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.

d. Submittals marked "not reviewed" indicate that the submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and certified by Contractor, or is not complete. A submittal marked "not reviewed" will 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.

e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Government. This applies only to "information-only submittals" as previously defined.

1.12 DISAPPROVED SUBMITTALS

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, give notice to the Contracting Officer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Government to require rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and resubmit 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 SUBMITTALS

The Contracting Officer's approval 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 by the Government for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the QC requirements of this contract, the Contractor is responsible for ensuring information contained with in each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will 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, provide assurance that the

materials or equipment will be available in quantities required in the project. No change or substitution will 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 that may be damaged in testing, will be returned to the Contractor, at its expense, upon completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Government reserves the right to disapprove any material or equipment that has previously 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 will automatically void previous approvals. Replace such materials or equipment to meet contract requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
RENOVATE BUILDING 3918 TO RELOCATE CHERRY POINT POST OFFICE

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/ DATE RCD FRM APPR AUTH	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		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 14 00	SD-01 Preconstruction Submittals															
			List of Contact Personnel	1.3.1.1														
		01 20 00	SD-01 Preconstruction Submittals															
			Schedule of Prices	1.3														
		01 30 00	SD-01 Preconstruction Submittals															
			View Location Map	1.3														
			Progress and Completion	1.4														
			Pictures															
		01 31 23.13 20	SD-01 Preconstruction Submittals															
			List of Contractor's Personnel	1.4.2														
		01 32 16.00 20	SD-01 Preconstruction Submittals															
			Baseline Construction Schedule	1.2														
			SD-07 Certificates															
			Monthly Updates	1.4														
		01 33 00	SD-01 Preconstruction Submittals															
			Submittal Register	1.8														
		01 33 29	SD-01 Preconstruction Submittals															
			Sustainability Action Plan	1.4.1														
		01 35 26	SD-01 Preconstruction Submittals															
			Accident Prevention Plan (APP)	1.9														
			Final IAQ Management Plan	1.17														
			Indoor Air Quality (IAQ)	1.17														
			Management Plan															
			SD-06 Test Reports															
			Accident Reports	1.13.2														
			LHE Inspection Reports	1.13.3														

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							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	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 35 26	Monthly Exposure Reports	1.5														
			SD-07 Certificates															
			Activity Hazard Analysis (AHA)	1.10														
			Certificate of Compliance	1.13.4														
			Contractor Safety Self-Evaluation	1.6														
			Checklist															
			Hot Work Permit	1.14														
			License Certificates	1.15														
			Portable Gauge Operations	1.15.1														
			Planning Worksheet															
			Radiography Operation Planning	1.15.1														
			Work Sheet															
			Standard Lift Plan	1.13.4														
		01 45 00	SD-01 Preconstruction Submittals															
			Contractor Quality Control (CQC)	1.5.2														
			Plan															
			SD-06 Test Reports															
			Verification Statement	1.12.3														
			SD-07 Certificates															
			Certificate Of Readiness	1.6.4.1														
		01 50 00	SD-01 Preconstruction Submittals															
			Construction Site Plan	1.3														
			Traffic Control Plan	3.3.1														
			Haul Road Plan	2.2.1														

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							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)
		01 50 00	Contractor Computer	1.6.1.4														
			Cybersecurity Compliance															
			Statements															
			Contractor Temporary Network	1.6.6														
			Cybersecurity Compliance															
			Statements															
			SD-06 Test Reports															
			Backflow Preventer Tests	3.4														
			SD-07 Certificates															
			Backflow Tester	1.4.1														
			Backflow Preventers	1.4														
		01 57 19	SD-01 Preconstruction Submittals															
			Preconstruction Survey	1.6.1														
			Regulatory Notifications	1.6.2														
			Environmental Manager	1.6.4														
			Qualifications															
			Employee Training Records	1.6.5														
			Environmental Protection Plan	1.7														
			Dirt and Dust Control Plan	1.7.9.1														
			Solid Waste Management Permit	1.10														
			Spill Prevention Control And	3.12.2														
			Countermeasure (SPCC) Plan															
			SD-06 Test Reports															
			Monthly Solid Waste Disposal	1.10.1														
			Report															
			SD-07 Certificates															

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		01 57 19	ECATTS Certificate Of	1.4.1.2														
			Completion															
			Employee Training Records	1.6.5														
			SD-11 Closeout Submittals															
			Regulatory Notifications	1.6.2														
			Assembled Employee Training	1.6.5														
			Records															
			Solid Waste Management Permit	1.10														
			As-Built Certifications for	3.16														
			Permitting Closeout															
			Waste Determination	3.7.1														
			Documentation															
			Project Solid Waste Disposal	3.7.2.1														
			Documentation Report															
			Sales Documentation	3.7.2.1														
			Hazardous Waste/Debris	3.7.3.1														
			Management															
			Disposal Documentation for	3.7.3.6														
			Hazardous and Regulated Waste															
			Contractor Hazardous Material	3.8.1														
			Inventory Log															
		01 74 19	SD-01 Preconstruction Submittals															
			Construction Waste Management	1.7														
			Plan															
			SD-11 Closeout Submittals															

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		01 74 19	Final Construction Waste	1.9	S													
			Diversion Report															
		01 78 00	SD-03 Product Data															
			Warranty Management Plan	1.5.1														
			Warranty Tags	1.5.4														
			Final Cleaning	3.3														
			Spare Parts Data	1.4														
			SD-08 Manufacturer's Instructions															
			Instructions	1.5.1														
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.2														
			Manuals															
			SD-11 Closeout Submittals															
			As-Built Drawings	3.1														
			As-Built Record of Equipment	1.5.1														
			and Materials															
			Certification of EPA Designated	2.1														
			Items															
			Certification Of USDA Designated	2.2														
			Items															
			Interim DD FORM 1354	3.4.1														
			Checklist for DD FORM 1354	3.4.2														
		01 78 23	SD-10 Operation and Maintenance															
			Data															
			Facility Data Workbook	1.4														

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		01 78 23	Training Plan	3.1.1														
			Training Outline	3.1.3														
			Training Content	3.1.2														
			Operation And Maintenance	3.2.1														
			Manual, Progress Submittal															
			Operation And Maintenance	3.2.2														
			Manual, Prefinal Submittal															
			Operation And Maintenance	3.2.3														
			Manual, Final Submittal															
			SD-11 Closeout Submittals															
			Training Video Recording	3.1.4														
			Validation of Training Completion	3.1.6														
			Training Plan	3.1.1														
		01 78 30.00 22	SD-11 Closeout Submittals															
			GIS Data Deliverables	1.3.7														
		01 91 00.15	SD-06 Test Reports															
			Completed Construction	3.5														
			Observation Checklists															
			Interim Construction Phase	3.4														
			Commissioning Plan															
			Final Construction Phase	3.4														
			Commissioning Plan															
			Initial Commissioning Report	3.9														
			Issues Log	1.13														
			SD-07 Certificates															
			Commissioning Firm	1.10														

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		01 91 00.15	SD-10 Operation and Maintenance															
			Data															
			Systems Manual	3.8														
			SD-11 Closeout Submittals															
			Final Commissioning Report	3.9														
			Updated Final Commissioning	3.10														
			Report															
			Final Commissioning Report	3.9														
			(eNotebook)															
			Updated Final Commissioning	3.10														
			Report (eNotebook)															
		02 41 00	SD-01 Preconstruction Submittals															
			Demolition Plan	1.2.2														
			Existing Conditions	1.10														
			SD-07 Certificates															
			Notification	1.6														
			SD-11 Closeout Submittals															
			Receipts	3.3.2														
		02 41 01	SD-01 Preconstruction Submittals															
			Deconstruction Plan	1.2.2														
			Existing Conditions	1.9														
			SD-07 Certificates															
			Notification	1.6														
		02 82 00	SD-03 Product Data															
			Amended Water	1.2.2														

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		02 82 00	Safety Data Sheets (SDS) for All	1.3.9														
			Materials															
			Encapsulants	2.1														
			Respirators	3.1.2.1														
			Local Exhaust Equipment	3.1.7														
			Pressure Differential Automatic	3.1.7														
			Recording Instrument															
			Vacuums	3.1.8														
			Glovebags	3.1.10														
			SD-06 Test Reports															
			Air Sampling Results	1.5.5														
			Pressure Differential Recordings	1.5.6														
			for Local Exhaust System															
			Clearance Sampling	3.2.14.5														
			Asbestos Disposal Quantity	3.3.3.2														
			Report															
			SD-07 Certificates															
			Employee Training	1.3.4														
			Notifications	1.3.5														
			Respiratory Protection Program	1.3.7														
			Asbestos Hazard Abatement Plan	1.3.10														
			Testing Laboratory	1.3.11														
			Landfill Approval	1.3.12														
			Delivery Tickets	1.3.12														
			Waste Shipment Records	1.3.12														
			Transporter Certification	1.3.13														

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		02 82 00	Medical Certification	1.3.14														
			Private Qualified Person	1.5.1														
			Documentation															
			Designated Competent Person	1.5.2														
			Worker's License	1.5.3														
			Contractor's License	1.5.4														
			Federal, State or Local Citations	1.5.9														
			on Previous Projects															
			Encapsulants	2.1														
			Equipment Used to Contain	3.1														
			Airborne Asbestos Fibers															
			Water Filtration Equipment	3.1.3.3														
			Vacuums	3.1.8														
			Ventilation Systems	3.1.8														
			SD-11 Closeout Submittals															
			Permits and Licenses	1.3.5														
			Notifications	1.3.5														
			Respirator Program Records	1.3.7.1														
			Rental Equipment	1.7.1														
		02 83 00	SD-01 Preconstruction Submittals															
			Competent Person	1.5.1.1														
			Training Certification	1.5.1.2														
			Occupational and Environmental	1.5.2.3														
			Assessment Data Report															
			Medical Examinations	1.5.2.4														
			Lead Waste Management Plan	1.5.2.8														

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		02 83 00	Licenses, Permits and	1.5.4														
			Notifications															
			Occupant Protection Plan	1.5.5														
			Lead Compliance Plan	1.5.2.2														
			Lead Compliance Plan	3.1.1.6														
			Initial Sample Results	3.4.1.1														
			Written Evidence of TSD	3.5.2.1														
			Approval															
			SD-03 Product Data															
			Respirators	1.6.1														
			Vacuum Filters	1.6.4														
			Negative Air Pressure System	1.6.7														
			Materials and Equipment	2.1														
			Expendable Supplies	2.1.1														
			Local Exhaust Equipment	3.1.1.5														
			Pressure Differential Automatic	3.1.1.5														
			Recording Instrument															
			Pressure Differential Log	3.1.1.6														
			SD-06 Test Reports															
			Occupational and Environmental	1.5.2.3														
			Assessment Data Report															
			Sampling Results	1.5.2.3														
			Pressure Differential Recordings	1.5.3														
			For Local Exhaust System															
			SD-07 Certificates															
			Testing Laboratory	1.5.1.3														

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		02 83 00	Third Party Consultant	1.5.1.4														
			Qualifications															
			Occupant Notification	3.1.1.1														
			Notification of the	3.1.1.1														
			Commencement of LCP Hazard															
			Abatement															
			Clearance Certification	3.5.1.1														
			SD-11 Closeout Submittals															
			Hazardous Waste Manifest	3.5.2.1														
		03 30 00	SD-01 Preconstruction Submittals															
			Laboratory Accreditation	1.6.4														
			SD-03 Product Data															
			Formwork Materials	2.1														
			Recycled Aggregate Materials	2.2.3.3														
			Cementitious Materials	2.2.1														
			Admixtures	2.2.4														
			Reinforcing Fibers	2.5.1														
			Local/Regional Materials	1.7.1														
			SD-05 Design Data															
			Concrete Mix Design	1.6.1.1														
			SD-06 Test Reports															
			Concrete Mix Design	1.6.1.1														
			Fly Ash	1.6.2.1														
			Pozzolan	1.6.2.1														
			Slag Cement	1.6.2.2														
			Aggregates	1.6.2.3														

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		03 30 00	Fiber-Reinforced Concrete	1.6.2.4														
			Compressive Strength Tests	3.8.2.2														
			Slump Tests	3.8.2.1														
			Water	2.2.2														
		03 30 53	SD-03 Product Data															
			Air-Entraining Admixture	2.2.3.1														
			Water-Reducing or Retarding	2.2.3.2														
			Admixture															
			Curing Materials	2.2.10														
			Expansion Joint Filler Strips,	2.2.6														
			Premolded															
			Conveying and Placing Concrete	3.2														
			Formwork	2.2.7														
			Mix Design Data	2.3														
			Ready-Mix Concrete	2.3														
			Mechanical Reinforcing Bar	2.2.5														
			Connectors															
			SD-06 Test Reports															
			Aggregates	2.2.2														
			Concrete Mixture Proportions	2.1.3														
			Compressive Strength Testing	3.8.3														
			Slump	3.8.3														
			Air Content	3.8.3														
			Water	2.2.4														
			SD-07 Certificates															
			Cementitious Materials	2.2.1														

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		03 30 53	Pozzolan	2.2.1.2														
			Aggregates	2.2.2														
			Delivery Tickets	2.3														
		04 20 00	SD-03 Product Data															
			Hot Weather Procedures	1.5.1														
			Cold Weather Procedures	1.5.2														
			Cementitious Materials	2.3.1.1														
			SD-04 Samples															
			Concrete Masonry Units (CMU)	2.2.2.2														
			Admixtures for Masonry Mortar	2.3.1.3														
			Anchors, Ties, and Bar	2.5.1														
			Positioners															
			Joint Reinforcement	2.5.2														
			SD-05 Design Data															
			Masonry Compressive Strength	2.1.2														
			SD-07 Certificates															
			Concrete Masonry Units (CMU)	2.2.2.2														
			Cementitious Materials	2.3.1.1														
			Admixtures for Masonry Mortar	2.3.1.3														
			Anchors, Ties, and Bar	2.5.1														
			Positioners															
			Joint Reinforcement	2.5.2														
			SD-08 Manufacturer’s Instructions															
			Admixtures for Masonry Mortar	2.3.1.3														
			SD-11 Closeout Submittals															
			Recycled Content	2.2.2.2.1	S													

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		05 40 00	SD-02 Shop Drawings															
			Framing Components	1.6.1														
			SD-03 Product Data															
			Studs, Joists	2.1														
			Recycled Content of Steel	2.1														
			Products															
			SD-05 Design Data															
			Metal Framing Calculations	1.6.2														
			SD-07 Certificates															
			Load-Bearing Cold-Formed Metal	1.4														
			Framing															
			Welds	3.2.1														
		06 41 16.00 10	SD-02 Shop Drawings															
			Shop Drawings	2.7														
			Installation	3.1														
			SD-03 Product Data															
			Wood Materials	2.1														
			Finish Schedule	2.7.7.3														
			SD-04 Samples															
			Plastic Laminates	2.2														
			Cabinet Hardware	2.4														
			SD-07 Certificates															
			Quality Assurance	1.5														
			Laminate Clad Casework	3.1														
			Certification	1.5.2														
		06 61 16	SD-02 Shop Drawings															

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		06 61 16	Detail Drawings	1.4.2														
			Installation	3.1														
			SD-03 Product Data															
			Solid Polymer Material	2.1														
			Qualifications	1.4.1														
			Fabrications	2.3														
			Indoor air quality for solid surface	2.2.4														
			seam and sealant products															
			SD-04 Samples															
			Material	2.1														
			Counter and Vanity Tops	2.3.5														
			SD-06 Test Reports															
			Solid Polymer Material	2.1														
			SD-07 Certificates															
			Fabrications	2.3														
			Qualifications	1.4.1														
			Indoor Air Quality for solid	2.1														
			surface fabrication products															
			SD-10 Operation and Maintenance															
			Data															
			Clean-up	3.2														
		07 21 16	SD-03 Product Data															
			Blanket Insulation	2.1														
			Recycled Content for Insulation	2.1.2	S													
			Materials															
			Accessories	2.2														

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		07 21 16	SD-07 Certificates															
			Indoor Air Quality for Insulation	2.1.4	S													
			Materials															
			SD-08 Manufacturer’s Instructions															
			Insulation	3.1.1														
		07 60 00	SD-02 Shop Drawings															
			Exposed Sheet Metal	2.2.1														
			Drip Edges	3.1.11														
			Recycled Content	2.1	S													
			SD-04 Samples															
			Finish Samples	1.4.2														
			SD-08 Manufacturer’s Instructions															
			Quality Control Plan	3.5														
			SD-10 Operation and Maintenance															
			Data															
			Cleaning and Maintenance	1.4.3														
		07 84 00.00 22	SD-02 Shop Drawings															
			Firestopping System	2.1														
			SD-03 Product Data															
			Firestopping Materials	2.2														
			Firestopping Materials	3.1														
			SD-06 Test Reports															
			Inspection Forms	3.3.1														
			Inspection Report	3.3.2														
			SD-07 Certificates															

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		07 84 00.00 22	Firestopping Inspector	1.5.2														
			Qualifications															
			Firestopping Materials	2.2														
			Firestopping Materials	3.1														
			Firestopping Installer	1.5.1														
			Qualifications															
		07 92 00	SD-03 Product Data															
			Sealants	2.1														
			Primers	2.2														
			Bond Breakers	2.3														
			Backstops	2.4														
			Field Adhesion	3.1														
			SD-07 Certificates															
			Indoor Air Quality For Interior	2.1.1	S													
			Sealants															
			Indoor Air Quality For Interior	2.1.3	S													
			Floor Joint Sealants															
			Indoor Air Quality For Interior	2.1.4	S													
			Acoustical Sealants															
		08 11 13	SD-02 Shop Drawings															
			Doors	2.1														
			Doors	2.1														
			Frames	2.4														
			Frames	2.4														
			Accessories	2.2														
			SD-03 Product Data															

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		08 11 13	Doors	2.1														
			Recycled Content for Steel Door	2.1	S													
			Product															
			Frames	2.4														
			Recycled Content for Steel Frame	2.4	S													
			Product															
			Accessories	2.2														
		08 11 16	SD-02 Shop Drawings															
			Door and Frame Assembly	1.5.1														
			SD-03 Product Data															
			Door and Frame Assembly	1.5.1														
			Recycled Content of Aluminum	2.3.2	S													
			Material															
			SD-04 Samples															
			Finish Samples	1.5.2														
			SD-08 Manufacturer’s Instructions															
			Door and Frame Assembly	1.5.1														
			Adjustments, Cleaning, and	1.5.3														
			Maintenance															
		08 14 00	SD-02 Shop Drawings															
			Doors	2.1														
			SD-03 Product Data															
			Doors	2.1														
			Recycled Content for Door Cores	2.1.1.1	S													
			Accessories	2.2														
			Water-resistant Sealer	2.3.5														

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		08 14 00	Warranty	1.5														
			SD-04 Samples															
			Door Finish Color	2.3.4.1														
			SD-07 Certificates															
			Certified Sustainably Harvested	2.1.1	S													
			Flush Wood Doors															
			Indoor Air Quality for	2.1.1.1	S													
			Particleboard and Agrifiber Door															
			Cores															
			SD-11 Closeout Submittals															
			Warranty	1.5														
		08 33 13	SD-02 Shop Drawings															
			Detail Drawings	1.3														
			SD-03 Product Data															
			Warranty	1.5														
			Rolling Counter Doors	2.1														
			Installation	3.1														
			Cleaning	3.3														
			SD-11 Closeout Submittals															
			Rolling Counter Door	2.3														
			(Non-Rated)															
		08 33 23	SD-02 Shop Drawings															
			Overhead Coiling Doors	2.2.1														
			Counterbalancing Mechanism	2.2.3														
			Electric Door Operators	2.2.4														
			Guides	2.1.1.1														

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		08 33 23	Mounting Brackets	2.2.3.1														
			Hood	2.2.2.2														
			Installation Drawings	2.1.1.1														
			SD-03 Product Data															
			Overhead Coiling Doors	2.2.1														
			Hardware	2.2.2														
			Counterbalancing Mechanism	2.2.3														
			Electric Door Operators	2.2.4														
			Recycled content for steel curtain	2.2.1.1	S													
			slats															
			SD-05 Design Data															
			Overhead Coiling Doors	2.2.1														
			Hardware	2.2.2														
			Counterbalancing Mechanism	2.2.3														
			Electric Door Operators	2.2.4														
			Wind Loading	2.1.2.1														
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	1.3.2														
			Manuals															
			SD-11 Closeout Submittals															
			Warranty	1.3.1														
		08 41 13	SD-02 Shop Drawings															
			Installation Drawings	3.3														
			Fabrication Drawings	2.2														
			SD-03 Product Data															

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		08 41 13	Finish	2.2.3														
			Recycled Content of Aluminum	2.1.1.2	S													
			Material															
			SD-06 Test Reports															
			Certified Test Reports	3.4.1														
			Certified Test Reports	3.4.2														
			Deflection	3.4.2														
			Air Infiltration	3.4.1														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Instructions	3.3														
			SD-11 Closeout Submittals															
			Manufacturer's Product Warranty	3.6														
		08 71 00	SD-02 Shop Drawings															
			Manufacturer's Detail Drawings	1.3														
			Verification of Existing Conditions	1.3														
			Hardware Schedule	1.5														
			Keying System	2.3.5														
			SD-03 Product Data															
			Hardware Items	2.3														
			SD-08 Manufacturer’s Instructions															
			Installation	3.1														
			SD-10 Operation and Maintenance															
			Data															
			Hardware Schedule	1.5														
			SD-11 Closeout Submittals															
			Key Bitting	1.6.1														

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		08 81 00	SD-03 Product Data															
			Glazing Accessories	1.3														
			Sealants	2.3.1.1														
			Joint Backer	2.3.2														
			SD-04 Samples															
			Tape	2.3.4														
			Sealing Tapes	2.3.4														
			SD-08 Manufacturer's Instructions															
			Setting and Sealing Materials	2.3														
			Glass Setting	3.2														
		09 22 00	SD-03 Product Data															
			Metal Support Systems	2.1														
			Recycled Content for Metal	2.1	S													
			Support Systems															
		09 29 00	SD-03 Product Data															
			Cementitious Backer Units	2.1.3														
			Abuse Resistant Gypsum Board	2.1.2														
			Accessories	2.1.6														
			Gypsum Board	2.1.1														
			Recycled Content for Gypsum	2.1.1	S													
			Board															
			Recycled Content for Paper	2.1.1	S													
			Facing and Gypsum Cores															
			VOC Content of Joint Compound	2.1.4	S													
			SD-07 Certificates															
			Asbestos Free Materials	2.1														

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		09 29 00	Indoor Air Quality for Gypsum	2.1.1	S													
			Board															
			SD-08 Manufacturer's Instructions															
			Safety Data Sheets	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Manufacturer Maintenance	2.1														
			Instructions															
		09 30 10	SD-02 Shop Drawings															
			Detail Drawings	3.2														
			SD-03 Product Data															
			Porcelain Tile	2.1.1														
			Setting-Bed	2.2														
			Mortar, Grout, and Adhesive	2.4														
			SD-04 Samples															
			Tile	2.1														
			Accessories	2.1														
			Transition Strips	2.1														
			Transition Strips	2.5														
			Grout	2.4														
			SD-07 Certificates															
			Indoor Air Quality for Adhesives	2.4														
			Indoor Air Quality for Sealants	2.4.4														
			SD-08 Manufacturer's Instructions															
			Maintenance Instructions	3.7														

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		09 30 10	SD-10 Operation and Maintenance															
			Data															
			Installation	3.2														
		09 51 00	SD-02 Shop Drawings															
			Drawings	2.1														
			SD-03 Product Data															
			Recycled Content for Type IX	2.2.1.1														
			Ceiling Tiles															
			Recycled Content for Suspension	2.3														
			Systems															
			Acoustical Performance	2.1.1														
			SD-04 Samples															
			Acoustical Units	2.2														
			SD-07 Certificates															
			Indoor Air Quality for Type IX	2.2.1.1														
			Ceiling Tiles															
			Indoor Air Quality for Humidity	2.2.2.1														
			Resistant Ceiling Tiles															
			Indoor Air Quality for Adhesives	2.5														
			Indoor Air Quality for Sealants	2.8														
		09 67 23.13	SD-03 Product Data															
			Manufacturer's Catalog Data	1.2.1														
			SD-04 Samples															
			Hardboard Mounted Epoxy	1.5.2														
			Flooring															
			SD-05 Design Data															

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		09 67 23.13	Design Mix Data	1.2.2														
			SD-07 Certificates															
			Listing of Product Installations	1.5.1														
			Referenced Standards	1.5														
			Certificates															
			SD-11 Closeout Submittals															
			Warranty	1.6														
		09 72 00	SD-03 Product Data															
			Wallcoverings and Accessories	2.1														
			Primer and Adhesive	2.4														
			SD-04 Samples															
			Wallcoverings and Accessories	2.1														
			SD-07 Certificates															
			Indoor Air Quality	1.3.1														
			SD-08 Manufacturer’s Instructions															
			Wallcoverings and Accessories	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Wallcoverings and Accessories	2.1														
		09 90 00	SD-02 Shop Drawings															
			Piping Identification	3.10														
			SD-03 Product Data															
			Coating	2.1														
			Product Data Sheets	2.1														
			SD-04 Samples															
			Color	2.2														

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		09 90 00	SD-07 Certificates															
			Indoor Air Quality for Paints and	1.6.4														
			Primers															
			SD-08 Manufacturer’s Instructions															
			Application Instructions	3.2.1														
			Mixing	2.1														
			Manufacturer's Safety Data	1.8.1														
			Sheets															
			SD-10 Operation and Maintenance															
			Data															
			Coatings	2.1														
		10 11 00	SD-02 Shop Drawings															
			Placement Schedule	3.1														
			SD-03 Product Data															
			Visual Display Unit	1.2														
			Visual Display Unit	2.1														
			SD-04 Samples															
			Aluminum	2.1.1														
			Glass	2.1.2														
			SD-07 Certificates															
			Certificate of Compliance	1.2														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Cleaning	3.3														
			Instructions															
			Manufacturer's Printed	3.2														
			Installation Instructions															

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		10 14 00.10	SD-02 Shop Drawings															
			Approved Detail Drawings	3.1														
			SD-03 Product Data															
			Installation	3.1														
			Exterior Signage	1.2														
			Wind Load Requirements	1.2.1														
			SD-04 Samples															
			Exterior Signage	1.2														
			SD-10 Operation and Maintenance															
			Data															
			Protection and Cleaning	3.1.2														
		10 14 00.20	SD-02 Shop Drawings															
			Detail Drawings	1.4.2														
			SD-03 Product Data															
			Installation	3.1														
			Warranty	1.6														
			SD-04 Samples															
			Interior Signage	1.4.1														
			Software	1.3														
			SD-10 Operation and Maintenance															
			Data															
			Approved Manufacturer's	3.1														
			Instructions															
			Protection and Cleaning	3.1.2														
		10 22 13	SD-02 Shop Drawings															
			Wire Mesh Partitions	1.4														

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		10 22 13	SD-03 Product Data															
			Wire Mesh Partitions	1.4														
			Recycled Content for Metal Post	2.1	S													
			and Framing Materials															
			Recycled Content for Wire	2.1	S													
			Materials															
		10 26 00	SD-02 Shop Drawings															
			Corner Guards	2.2														
			SD-03 Product Data															
			Corner Guards	2.2														
			SD-04 Samples															
			Finish	2.4														
			SD-06 Test Reports															
			Corner Guards	2.2														
			SD-07 Certificates															
			Corner Guards	2.2														
			Indoor air quality for adhesives	2.5														
		10 28 13	SD-02 Shop Drawings															
			Product Schedule	2.1														
			SD-03 Product Data															
			Recycled content for stainless	2.1														
			steel toilet accessories															
			Sanitary Napkin Disposal (SND)	2.1.3														
			Grab Bar (GB36) (GB42)	2.1.4														
			Grab Bar: L-Shaped (GBL)	2.1.5														

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		10 28 13	Shelf, Mop and Broom Holder	2.1.6														
			(MHS)															
			Robe Hook (RH)	2.1.7														
			Shower Curtain Rod (SCR)	2.1.8														
			Toilet Tissue Dispenser (TTD)	2.1.9														
			Mirror (WM)	2.1.10														
			Foam Soap Dispenser (SD)	2.1.11														
			Semi Recessed Waste	2.1.12														
			Receptacle and Paper Towel															
			Dispenser (ITDW)															
			Shower Seat (FSS)	2.1.13														
			SD-10 Operation and Maintenance															
			Data															
			Grab Bar (GB36) (GB42)	2.1.4														
			Grab Bar: L-Shaped (GBL)	2.1.5														
			Shelf, Mop and Broom Holder	2.1.6														
			(MHS)															
			Robe Hook (RH)	2.1.7														
			Shower Curtain Rod (SCR)	2.1.8														
			Toilet Tissue Dispenser (TTD)	2.1.9														
			Mirror (WM)	2.1.10														
			Foam Soap Dispenser (SD)	2.1.11														
			Semi Recessed Waste	2.1.12														
			Receptacle and Paper Towel															
			Dispenser (ITDW)															
			Shower Seat (FSS)	2.1.13														

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		10 44 16	SD-02 Shop Drawings															
			Fire Extinguishers	1.3														
			Accessories	Part 2														
			Cabinets	Part 2														
			Schedule	1.3														
			SD-03 Product Data															
			Fire Extinguishers	1.3														
			Accessories	Part 2														
			Cabinets	Part 2														
			Replacement Parts List	3.2.1														
		10 51 13	SD-02 Shop Drawings															
			Types	2.2														
			Location	1.4														
			Installation	3.1														
			Numbering System	3.2														
			SD-03 Product Data															
			Material	2.3														
			Locking Devices	2.4.1														
			Handles	2.4.4														
			Finish	2.3.3														
			Components	2.4														
			Assembly	3.1														
			SD-04 Samples															
			Color Chips	1.5.1														
		11 05 40	SD-01 Preconstruction Submittals															

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		11 05 40	Contractor's Field Verification	1.3														
			Data															
			SD-02 Shop Drawings															
			Utilities	1.5.1														
			SD-06 Test Reports															
			Field Test Reports	3.6.2														
		11 13 30	SD-02 Shop Drawings															
			TOP OF GROUND DOCK LIFTS	2.1														
			SD-03 Product Data															
			TOP OF GROUND DOCK LIFTS	2.1														
			SD-10 Operation and Maintenance															
			Data															
			MAINTENANCE	3.3														
			SD-11 Closeout Submittals															
			WARRANTY	1.4														
		12 00 01.00 20	SD-01 Preconstruction Submittals															
			FF&E Schedule and Schedule	3.1.1.3														
			Updates															
			Contractor's Interior Designer's	3.1.1.1														
			Qualifications															
			SD-04 Samples															
			Interior Finish Construction	3.1.2.11														
			Submittals															
			Post Option Award FF&E Finish	3.2.3														
			Submittals															
			SD-05 Design Data															

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		12 00 01.00 20	FF&E Basis of Design Package	3.1.2.2.2														
			FF&E BVD Request for Quotation	3.1.2.5														
			(RFQ) Package															
			BVD Package	3.1.2.6														
			Pre-Final FF&E Package 'Over	3.1.2.8														
			the Shoulder'															
			Pre-Final FF&E Package	3.1.2.9														
			Final FF&E Package	3.1.2.10														
			SD-10 Operation and Maintenance															
			Data															
			Warranty and Maintenance	3.5.1														
			Information															
			SD-11 Closeout Submittals															
			Punch List(s) Submittal	3.3.2														
		21 13 13	SD-01 Preconstruction Submittals															
			Qualified Fire Protection Engineer	1.2.3														
			(QFPE)															
			Sprinkler System Designer	1.4.2.1														
			Sprinkler System Installer	1.4.2.2														
			SD-02 Shop Drawings															
			Shop Drawing	1.2.1.1														
			Shop Drawing	1.4.1.1														
			SD-03 Product Data															
			Pipe	2.2.1.1														
			Fittings	2.2.1.2														
			Relief Valves	2.4.5														

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		21 13 13	Sprinklers	2.3														
			Pipe Hangers and Supports	2.2.3														
			Air Vent	2.4.6														
			Nameplates	2.1.2														
			SD-05 Design Data															
			Hydraulic Calculations	1.2.1.2														
			SD-06 Test Reports															
			Test Procedures	3.6.1														
			SD-07 Certificates															
			Verification of Compliant	3.6.2.1														
			Installation															
			Request for Government Final	3.6.2.2														
			Test															
			SD-10 Operation and Maintenance															
			Data															
			Operating and Maintenance	3.8														
			(O&M) Instructions															
			Spare Parts	1.6														
			SD-11 Closeout Submittals															
			As-built drawings	3.8														
		22 00 00	SD-02 Shop Drawings															
			Plumbing System	3.8.1														
			SD-03 Product Data															
			Backflow Prevention Assemblies	3.8.1.1														
			Fixtures	2.4														
			Shower Faucets	2.4.6														

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		22 00 00	Flush Valve Water Closets	2.4.2														
			Countertop Lavatories	2.4.3														
			Kitchen Sinks	2.4.4														
			Water Heaters	2.9														
			Pumps	2.10														
			Vibration-Absorbing Features	3.4														
			Thermostatic Mixing Valves	2.3.3														
			Temperature Controlled Mixing	2.3.4														
			Valve															
			Point-Of-Use Mixing Valve	2.3.5														
			Automatic Temperature And	2.3.6														
			Pressure Compensating Valve															
			SD-06 Test Reports															
			Tests, Flushing and Disinfection	3.8														
			Test of Backflow Prevention	3.8.1.1														
			Assemblies															
		23 05 93.00 22	SD-01 Preconstruction Submittals															
			Reports of Existing Conditions	1.5.3.1														
			Independent TAB Agency and	1.5.1														
			Personnel Qualifications															
			Pre-Field Engineering Report	3.7.2														
			SD-06 Test Reports															
			Completed Pre-Final DALT	3.3.6														
			Report															
			Certified Final DALT Report	3.3.9														
			Proportional Balancing	3.7.1														

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		23 05 93.00 22	Season 1	3.7.1														
			Season 2	3.7.1														
			SD-07 Certificates															
			Independent TAB Agency and	1.5.1														
			Personnel Qualifications															
			Advance Notice of Pre-Final	3.3.3														
			DALT Field Work															
			Proportional Balancing	3.7.1														
			Season 1	3.7.1														
			Season 2	3.7.1														
		23 07 00	SD-02 Shop Drawings															
			MICA Plates	3.2.2.4														
			Pipe Insulation Systems	2.3														
			Pipe Insulation Systems	3.2														
			Duct Insulation Systems	3.3														
			Equipment Insulation Systems	3.4														
			Recycled content for insulation	2.3.1														
			materials															
			SD-03 Product Data															
			Pipe Insulation Systems	2.3														
			Pipe Insulation Systems	3.2														
			Duct Insulation Systems	3.3														
			Equipment Insulation Systems	3.4														
			SD-07 Certificates															
			Indoor air quality for adhesives	2.2.1														
			SD-08 Manufacturer's Instructions															

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		23 07 00	Pipe Insulation Systems	2.3														
			Pipe Insulation Systems	3.2														
			Duct Insulation Systems	3.3														
		23 08 00	SD-03 Product Data															
			Test Equipment	2.1														
			SD-06 Test Reports															
			Pipe Flushing, Testing, And	1.5														
			Water Treatment Reports															
			Completed Pre-Functional	3.3														
			Checklists															
			Seasonal Test Report	3.11														
			SD-07 Certificates															
			Certificate Of Readiness	1.6														
		23 09 00	SD-02 Shop Drawings															
			DDC Contractor Design Drawings	3.3														
			Draft As-Built Drawings	3.3														
			Final As-Built Drawings	3.3														
			SD-03 Product Data															
			Programming Software	1.8.3														
			Controller Application Programs	1.8.4														
			Configuration Software	1.8.1														
			Controller Configuration Settings	1.8.2														
			Manufacturer's Product Data	2.2														
			SD-05 Design Data															
			Boiler Or Chiller Plant Gateway	1.9														
			Request															

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		23 09 00	SD-06 Test Reports															
			Existing Conditions Report	3.1.1														
			Pre-Construction Quality Control	1.10.1														
			(QC) Checklist															
			Post-Construction Quality Control	1.10.2														
			(QC) Checklist															
			Start-Up Testing Report	3.5.2														
			Control Contractor's Performance	3.6.5														
			Verification Testing Plan															
			Equipment Supplier's	3.6.3.1														
			Performance Verification Testing															
			Plan															
			Endurance Testing Results	3.6.8.3														
			Performance Verification Test	3.6.9														
			Report															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.7														
			(O&M) Instructions															
			Training Documentation	3.9.1														
			SD-11 Closeout Submittals															
			Enclosure Keys	2.5														
			Password Summary Report	3.2.6.1														
			Closeout Quality Control (QC)	1.10.3														
			Checklist															
		23 23 00	SD-02 Shop Drawings															

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		23 23 00	Refrigerant Piping System	2.3														
			SD-03 Product Data															
			Refrigerant Piping System	2.3														
			Qualifications	1.3.1														
			Refrigerant Piping Tests	3.4														
			SD-06 Test Reports															
			Refrigerant Piping Tests	3.4														
			SD-07 Certificates															
			Service Organization	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Maintenance	1.5														
			Operation and Maintenance	3.3														
			Manuals															
		23 30 00	SD-02 Shop Drawings															
			Detail Drawings	1.4.4														
			SD-03 Product Data															
			Insulated Nonmetallic Flexible	2.9.1.1														
			Duct Runouts															
			Duct Connectors	2.9.1.1														
			Duct Access Doors	2.9.3														
			Manual Balancing Dampers	2.9.4														
			Diffusers	2.9.6.1														
			Registers and Grilles	2.9.6.3														
			Louvers	2.9.7														
			In-Line Centrifugal Fans	2.10.1.1														

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		23 30 00	Ceiling Exhaust Fans	2.10.1.2														
			PL-109-58 label for ceiling	2.10.1.2														
			exhaust fan product															
			Variable Volume, Single Duct	2.11.1.1														
			Terminal Units															
			Test Procedures	1.4.5														
			Diagrams	1.2.1.2														
			Indoor Air Quality for Duct	2.9.1														
			Sealants															
			Exterior Ductwork	2.9.2														
			SD-06 Test Reports															
			Performance Tests	3.11														
			SD-07 Certificates															
			Ozone Depleting Substances	1.4.3														
			Technician Certification															
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Installation	3.2														
			Instructions															
			Operation and Maintenance	3.13.2														
			Training															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.13.1														
			Manuals															
			Manual Balancing Dampers	2.9.4														

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		23 30 00	Variable Volume, Single Duct	2.11.1.1														
			Terminal Units															
			SD-11 Closeout Submittals															
			Indoor Air Quality During	3.12														
			Construction															
		23 81 00	SD-03 Product Data															
			Coil Corrosion Protection	2.5.1														
			Supplied Products	2.1														
			Manufacturer's Standard Catalog	2.2														
			Data															
			SD-06 Test Reports															
			Refrigerant Tests, Charging, and	3.4														
			Start-Up															
			System Performance Tests	3.5														
			SD-07 Certificates															
			Service Organizations	3.6.2														
		25 05 11	SD-01 Preconstruction Submittals															
			Wireless and Wired Broadcast	3.2.3.3														
			Communication Request															
			Device Account Lock Exception	3.3.2														
			Request															
			Multiple Ethernet Connection	3.2.5.2														
			Device Request															
			Contractor Computer	1.9.1.6														
			Cybersecurity Compliance															
			Statements															

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		25 05 11	Contractor Temporary Network	1.9.6														
			Cybersecurity Compliance															
			Statements															
			Cybersecurity Interconnection	1.7.2														
			Schedule															
			Protection of Information At Rest	3.7.4														
			Proposal															
			Proposed STIG and SRG	1.7.1														
			Applicability Report															
			SD-02 Shop Drawings															
			Network Communication Report	1.7.3														
			Cybersecurity Riser Diagram	1.7.6														
			SD-03 Product Data															
			Control System Cybersecurity	1.7.8														
			Documentation															
			SD-06 Test Reports															
			Wireless Communication Test	3.2.3.4														
			Report															
			Control System Cybersecurity	3.14.1														
			Testing Procedures															
			Control System Cybersecurity	3.14.3														
			Testing Report															
			SD-07 Certificates															
			Software Licenses	1.8														
			SD-11 Closeout Submittals															

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		25 05 11	Password Change Summary	3.4.3.5														
			Report															
			Enclosure Keys	3.3.7														
			Software and Configuration	1.7.5														
			Backups															
			Auditing Front End Software	3.5.3														
			Device Audit Record Upload	3.5.4.2														
			Software															
			System Maintenance Tool	3.9														
			Software															
			Control System Scanning Tools	3.11.2														
			STIG, SRG and Vendor Guide	1.7.7														
			Compliance Result Report															
			Control System Inventory Report	1.7.4														
			Integrity Verification Software	3.13.2														
		26 20 00	SD-02 Shop Drawings															
			Panelboards	2.12														
			Transformers	2.14														
			SD-03 Product Data															
			Receptacles	2.11														
			Circuit Breakers	2.12.3														
			Switches	2.9														
			Transformers	2.14														
			Enclosed Circuit Breakers	2.13														
			Manual Motor Starters	2.15														
			Surge Protective Devices	2.24														

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		26 20 00	Cable Trays	2.3														
			SD-06 Test Reports															
			600-volt Wiring Test	3.5.2														
			Grounding System Test	3.5.5														
			Transformer Tests	3.5.3														
			Ground-fault Receptacle Test	3.5.4														
			SD-07 Certificates															
			Fuses	2.10														
			SD-09 Manufacturer’s Field															
			Reports															
			Transformer Factory Tests	2.26.1														
			SD-10 Operation and Maintenance															
			Data															
			Electrical Systems	1.5.1														
		26 27 14.00 20	SD-02 Shop Drawings															
			Installation Drawings	1.3.1														
			SD-03 Product Data															
			Electricity Meters	2.1.3														
			Current Transformer	2.1.2														
			Communications	2.2														
			SD-06 Test Reports															
			Acceptance Checks and Tests	3.2.1														
			System Functional Verification	3.2.2														
			Building Meter Installation Sheet,	3.2.1														
			per Building															
			Meter Configuration Template	2.1.1														

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		26 27 14.00 20	Meter Configuration Report	3.2.1														
			SD-10 Operation and Maintenance															
			Data															
			Electricity Meters and	1.4.1														
			Accessories															
			SD-11 Closeout Submittals															
			System Functional Verification	3.2.2														
		26 51 00	SD-03 Product Data															
			Luminaires	2.2														
			Light Sources	2.3														
			LED Drivers	2.4														
			Luminaire Warranty	1.6.1														
			Lighting Controls Warranty	1.6.2														
			Switches	2.5.1.1														
			Wall Box Dimmers	2.5.1.2														
			Occupancy/Vacancy Sensors	2.5.1.3														
			Power Packs	2.5.1.3.4														
			Exit Signs	2.6.1														
			Emergency Drivers	2.6.3														
			SD-06 Test Reports															
			ANSI/IES LM-79 Test Report	1.5.1														
			ANSI/IES LM-80 Test Report	1.5.2														
			ANSI/IES TM-21 Test Report	1.5.3														
			ANSI/IES TM-30 Test Report	1.5.4														
			Occupancy/Vacancy Sensor	3.2.1.1														
			Verification Test															

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		26 51 00	SD-07 Certificates															
			LED Driver and Dimming Switch	1.5.5														
			Compatibility Certificate															
			SD-10 Operation and Maintenance															
			Data															
			Lighting System	1.7.1														
		27 10 00	SD-02 Shop Drawings															
			Telecommunications Drawings	1.6.1.1														
			Telecommunications Space	1.6.1.2														
			Drawings															
			SD-03 Product Data															
			Telecommunications Cabling	2.3														
			Patch Panels	2.4.5														
			Telecommunications	2.5														
			Outlet/Connector Assemblies															
			Equipment Support Frame	2.4.2														
			Connector Blocks	2.4.3														
			SD-06 Test Reports															
			Telecommunications Cabling	3.5.1														
			Testing															
			SD-07 Certificates															
			Telecommunications Contractor	1.6.2.1														
			Key Personnel	1.6.2.2														
			Manufacturer Qualifications	1.6.2.3														
			Test Plan	1.6.3														

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		27 10 00	SD-09 Manufacturer's Field															
			Reports															
			Factory Reel Tests	2.10.1														
			SD-10 Operation and Maintenance															
			Data															
			Telecommunications Cabling and	1.10.1														
			Pathway System															
			SD-11 Closeout Submittals															
			Record Documentation	1.10.2														
		28 31 76	SD-01 Preconstruction Submittals															
			Qualified Fire Protection Engineer	1.3.2														
			(QFPE)															
			Fire alarm system designer	1.9.2.1														
			Supervisor	1.9.2.2														
			Technician	1.9.2.3														
			Installer	1.9.2.4														
			Test Technician	1.9.2.5														
			Fire Alarm System Site-Specific	1.7														
			Software Acknowledgement															
			SD-02 Shop Drawings															
			Nameplates	1.9.1.3														
			Instructions	2.2.4														
			Wiring Diagrams	1.9.1.4														
			System Layout	1.9.1.5														
			Notification Appliances	1.9.1.6														
			Initiating devices	1.9.1.7														

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		28 31 76	Amplifiers	1.9.1.8														
			Battery Power	1.9.1.9														
			Voltage Drop Calculations	1.9.1.10														
			SD-03 Product Data															
			Fire Alarm and Mass Notification	2.3														
			Control Unit (FMCU)															
			Local Operating Console (LOC)	1.4.4														
			Amplifiers	1.9.1.8														
			Tone Generators	2.5														
			Digitalized voice generators	2.5														
			LCD Annunciator	2.6.1														
			Manual Stations	2.7														
			Smoke Detectors	2.8														
			Duct Smoke Detectors	2.8.2														
			Addressable Interface Devices	2.9														
			Addressable Control Modules	2.10														
			Isolation Modules	2.11														
			Notification Appliances	1.9.1.6														
			Batteries	2.14.1														
			Battery Chargers	2.14.2														
			Supplemental Notification	2.14.1.1														
			Appliance Circuit Panels															
			Auxiliary Power Supply Panels	2.14.1.1														
			Surge Protective Devices	2.15														
			Alarm Wiring	2.15														
			Back Boxes and Conduit	3.3.4														

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		28 31 76	Ceiling Bridges	3.2.8														
			Terminal Cabinets	3.3.2														
			Environmental Enclosures or	2.18														
			Guards															
			Document Storage Cabinet	3.11.3														
			SD-06 Test Reports															
			Test Procedures	3.7.1														
			SD-07 Certificates															
			Verification of Compliant	3.7.2.1														
			Installation															
			Request for Government Final	3.7.2.2														
			Test															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.9														
			(O&M) Instructions															
			Instruction of Government	3.10														
			Employees															
			SD-11 Closeout Submittals															
			As-Built Drawings	1.9.1.13														
			Spare Parts	1.11.1														
		31 00 00	SD-01 Preconstruction Submittals															
			Disposition of Surplus Materials	3.9														
			SD-03 Product Data															
			Geotextile	2.5														
			SD-04 Samples															

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		31 00 00	Geotextile	2.5														
			SD-06 Test Reports															
			Dewatering Performance Records	3.1.2.2														
			Material Test Report	3.10														
		32 17 23.16	SD-01 Preconstruction Submittals															
			Safety Data Sheets For Each	2.2														
			Paint Type															
			Safety Data Sheets For	2.1.1														
			Chemicals Used In Surface															
			Preparation															
			Data Sheets For Paint Removal	2.1.1														
			Equipment															
			Surface Preparation Equipment	2.1														
			List															
			Marking Applications Equipment	2.1.2														
			List															
			Detour Plans	1.4.2														
			SD-03 Product Data															
			Manufacturer Data Sheets for all	2.2														
			Marking Materials															
			SD-06 Test Reports															
			Marking Application Wet Film	3.4.3.1														
			Thickness Test															
			SD-07 Certificates															
			Manufacturer Certificate of	2.2														
			Compliance for Marking Materials															

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		32 17 23.16	Manufacturer Certificate of	2.2													
			Compliance for Reflective														
			Materials														
			Manufacturer Certificate of	1.4.1.3													
			Conformance for Volatile Organic														
			Compliance														
			SD-08 Manufacturer's Instructions														
			Marking Materials Storage and	1.3													
			Application														
			Reflective Media Storage and	1.3													
			Application														
			Chemicals Used in Surface	1.3													
			Preparation														
		32 92 23	SD-03 Product Data														
			Fertilizer	2.4													
			SD-06 Test Reports														
			Topsoil composition tests	2.2.3													
			SD-07 Certificates														
			sods	2.1													

SECTION 01 33 29

SUSTAINABILITY REQUIREMENTS AND REPORTING
02/21

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.

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

INTERNATIONAL CODE COUNCIL (ICC)

ICC IgCC	(2018) International Green Construction Code

U.S. DEPARTMENT OF AGRICULTURE (USDA)

FSRIA 9002	Farm Security and Rural Investment Act Section 9002 (USDA BioPreferred Program)

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-02	(2020; with Change 1, 2020; Change 2, 2022) High Performance and Sustainable Building Requirements
UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

U.S. DEPARTMENT OF ENERGY (DOE)

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

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

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, and other identified requirements.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sustainability Action Plan

1.4 GUIDING PRINCIPLES VALIDATION (GPV)

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

a. Analysis of each Guiding Principle Requirement and how project complies.

b. Sustainability Action Plan.

e. Construction related documentation for the project Sustainability eNotebook and keep updated with regularly-scheduled Construction Quality Control Meetings. Include construction related documentation containing the following components:

(2) Sustainability Action Plan

(3) Documentation illustrating HPSB Guiding Principles Requirements compliance, including "S" submittals

1.4.1 Sustainability Action Plan

Include the following information in the Sustainability Action Plan:

a. Analysis of each HPSB Guiding Principles Requirement and how project will comply.

b. Name and contact information for: Contractor's Point of Contact (POC) ensuring sustainability goals are accomplished and documentation is assembled. For TPC that include on-site visit by third party representative, provide list of required attendees.

c. Indoor Air Quality plan.

1.4.2 Calculations

Provide all calculations, product data, labels and product certifications required in this specification to demonstrate compliance with the HPSB Guiding Principles Requirements.

1.5 SUSTAINABILITY SUBMITTALS

1.5.1 "S" Submittals for Sustainability Documentation

"S" submittals are the sustainability documentation requirements cited in the various sections of this contract. Submit the GPV sustainability documentation required in this section as "S" submittals in all affected UFGS Sections.

a. Highlight GPV compliance data in "S" submittal.

b. Add "S" submittals to the Sustainability eNotebook only after submittal approval, and bookmark them as required in paragraph SUSTAINABILITY ENOTEBOOK below.

c. Ensure all approved "S" submittals are included in each Sustainability eNotebook submittal.

1.6 DOCUMENTATION REQUIREMENTS

a. Incorporate each of the following HPSB Guiding Principles requirements into project and provide documentation that proves compliance with each listed requirement. Items below are organized by HPSB Guiding Principles. For life-cycle cost analysis requirements, one document with all analyses is acceptable, with Contracting Officer approval.

b. For each of the following paragraphs that require the use of products listed on Government-required websites, provide documentation of the process used to select products, or process used to determine why listed products do not meet project performance requirements.

1.6.1 Energy Efficient Products

Provide only energy-using products that are Energy Star rated or have Federal Energy Management Program (FEMP) recommended efficiency. Where Energy Star or FEMP recommendations have not been established, provide most efficient products that are life-cycle cost-effective. Provide only energy using products that meet FEMP requirements for low standby power consumption. Energy efficient products can be found at: https://www.energy.gov/eere/femp/federal-energy-management-program and http://www.energystar.gov/.

For construction submittal documentation, provide proof that product is labeled energy efficient and complies with the cited requirements.

1.6.2 Building-level Power Metering

Provide building-level meters for electricity, natural gas, and steam where applicable.

1.6.2.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.3 Indoor Water Use

Provide Construction Documentation proof that fixtures are labeled EPA WaterSense, for products available with EPA WaterSense labeling; for all other fixtures, proof they comply with EPA WaterSense efficiency requirements.

1.6.4 Indoor Water Metering

Provide building-level meters for potable water use. Provide the requirements cited in the following paragraphs:

1.6.4.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.5 Outdoor Water Use

Where new irrigation is required, provide only non-potable sources. Provide the requirements cited in the following paragraphs:

1.6.5.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.6 Outdoor Water Meters

Provide meters for outdoor systems that use potable water. Provide the requirements cited in the following paragraphs:

1.6.6.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.7 Moisture Control

Provide the following:

1.6.7.1 Construction Submittal Documentation

Ensure construction materials are separated and protected in accordance with other sections in this contract document, with adequate humidity controls during construction. In accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, includes plan for ongoing building moisture control.

Coordinate with the moisture control requirements of Section 01 45 00 QUALITY CONTROL.

1.6.8 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

Meet the requirements of Table 3-1 at the end of this specification.

For Construction submittal documentation, provide certifications or labels that demonstrate compliance with cited requirements, based on the attached TABLE 3-1.

1.6.9 Indoor Air Quality During Construction

Prior to construction, create indoor air quality plan. Develop and implement an IAQ construction management plan during construction and flush building air before occupancy.

For new construction and for renovation of unoccupied existing buildings, meet the requirements of ICC IgCC 1001.3.1.5 (10.3.1.4) Indoor Air Quality (IAQ) Construction Management.

Provide documentation showing that after construction ends and prior to occupancy, HVAC filters were replaced and buildingarea air was flushed out in accordance with the cited standard.

1.6.10 Recycled Content

Comply with 40 CFR 247. Refer to: https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program for assistance identifying products cited in 40 CFR 247. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements.

1.6.10.1 Construction Submittal Documentation

a. Provide manufacturers' documents stating the recycled content by material, or written justification for claiming one of the exceptions allowed on the cited website.

b. Substitutions: Submit for Government approval for proposed alternative products or systems that provide equivalent performance and appearance and have greater contribution to project recycled content requirements. For all such proposed substitutions, submit with the Sustainability Action Plan accompanied by product data demonstrating equivalence.

c. In order to complete compliance with FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items, refer to submittal requirement for recycled/recovered material content in Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.11 Bio-Based Products

Provide products and materials composed of the highest percentage of bio-based materials (including rapidly renewable resources and certified sustainably harvested products), consistent with FSRIA 9002 USDA BioPreferred Program, to the maximum extent possible without jeopardizing the intended end use or detracting from the overall quality delivered to the end user and when available at a reasonable cost. Use only supplies and materials of a type and quality that conform to applicable specifications and standards.

Comply with FSRIA 9002 USDA BioPreferred Program. Refer to www.biopreferred.gov for the product categories and BioPreferred Catalog. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements. Provide the following documentation:

a. USDA BioPreferred label for each product; for bio-based products used on project but not listed with BioPreferred program, provide bio-based content and percentage.

b. In order to complete compliance with FAR 52.223-1 Biobased Product Certification, refer to submittal requirement for biobased products in Section 01 78 00 CLOSEOUT SUBMITTALS, paragraphs CERTIFICATION OF EPA DESIGNATED ITEMS and CERTIFICATION OF USDA DESIGNATED ITEMS.

1.6.12 Waste Material Management (Recycling – Construction)

Divert demolition and construction debris in accordance with Section

01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

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. Ensure the designated sustainability professional responsible for GP documentation participates in these meetings to coordinate documentation completion. Review GP sustainability requirements and Sustainability Action Plan at the following meetings:

a. Pre-Construction Conference

b. Construction Quality Control Meetings

g. 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, and actions that will achieve requirements. Conduct corrective actions prior to turnover, to ensure all requirements are achieved.

3.2 TABLE 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW EMITTING MATERIALS) REQUIREMENTS

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Adhesives and Sealants	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	Adhesives (carpet, resilient, wood flooring; base cove; ceramic tile; drywall and panel; primers) Sealants (acoustical; firestop; HVAC Air duct; primers) Caulks	**SCAQMD Rule 1168** (Use "other" category for HVAC duct sealant) (for firestop adhesive, UFC 3-600-01 overrides conflicting requirements)
			Aerosol adhesives	**Section 3 of Green Seal Standard GS-36** (except: cleaners, solvent cements, and primers used with plastic piping and conduit in plumbing, fire suppression, and electrical systems; HVAC air duct sealants when the application space air temp is less than 40 F (4.5 C).

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	Flat and nonflat, nonflat high-gloss, specialty, basement specialty, fire-resistive, floor, low-solids, rust preventative, wood, reflective wall coatings; concrete/masonry sealers; primers; sealers; undercoaters; shellacs (clear and opaque); stains; varnishes; conjugated oil varnish; lacquer; clear brushing lacquer	**Green Seal Standard GS-11**

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	Concrete curing compounds; dry fog, faux finishing, graphic arts (sign paints), industrial maintenance, mastic texture, metallic pigmented, multicolor, recycled coatings; pretreatment wash primers, reactive penetrating sealers; specialty primers, wood preservatives, and zinc primers	**California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings** or **SCAQMD Rule 1113r**
Paints and Coatings	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	High-temperature coatings; stone consolidants; swimming-pool coatings; tub- and tile-refining coatings; and waterproofing membranes	**California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings**

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Floor Covering Materials	For carpet, all locations: **CDPH/EHLB/Standard Method V1.1 (California Section 01350)** or label for **Section 9** of **CDPH/EHLB/Standard Method V1.1 (California Section 01350)**		none	none
Insulation	**CDPH/EHLB/Standard method V1.1** (California Section 01350) (Use "office" or "classroom" space limits for all applications)		none	none

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Composite Wood, Wood Structural Panel, and Agrifiber Products, no added urea-formaldehyde resins including laminating adhesives for composite wood and agrifiber assemblies - particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, door cores	Third-party certification (approved by CARB) of **California Air Resource Board's (CARB) regulation**, Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products	or	none	**CDPH/EHLB/Standard method V1.1** (California Section 01350) (Use "office" or "classroom" space limits for all applications) (except: Structural panel components such as plywood, particle board, wafer board, and oriented strand board identified as "EXPOSURE 1," "EXTERIOR," or "HUD-APPROVED" are considered acceptable for interior use.)
Office Furniture Systems and Seating installed prior to occupancy	**ANSI/BIFMA X7.1 ANSI/BIFMA X7.1:** (95-percent of installed office furniture system workstations and seating units) **Section 7.6.2 of ANSI/BIFMA e3** (50-percent of office furniture system workstations and seating units)		none	none

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	**EMISSIONS REQUIREMENT**		**MATERIALS WITH ADDED VOC REQUIREMENT**	**EMISSIONS REQUIREMENTS**
Ceiling and Wall assemblies and systems including: acoustical treatments; ceiling panels and tiles; tackable wall panels and coverings; wall coverings; wall and ceiling paneling and planking	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)		none	none

-- End of Section --

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS
05/24

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

ASTM INTERNATIONAL (ASTM)

ASTM D6245	(2012) 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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA Z535.2	(2011; R 2017) Environmental and Facility Safety Signs

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 51B	(2024) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 70E	(2024) Standard for Electrical Safety in the Workplace
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 -- Safety and Occupational Health (SOH) Requirements

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1926	Safety and Health Regulations for Construction
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
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, 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.

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. 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. 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 all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP)

Final IAQ Management Plan
Indoor Air Quality (IAQ) Management Plan

SD-06 Test Reports

Accident Reports
LHE Inspection Reports
Monthly Exposure Reports

SD-07 Certificates

Activity Hazard Analysis (AHA)
Certificate of Compliance
Contractor Safety Self-Evaluation Checklist
Hot Work Permit
License Certificates
Portable Gauge Operations Planning Worksheet
Radiography Operation Planning Work Sheet
Standard Lift Plan

1.4 PUBLIC HEALTH EMERGENCIES

In the event of a declared public health emergency, follow safety precautions as required by the Occupational Safety and Health Administration (OSHA) www.osha.gov, the Centers for Disease Control and Prevention (CDC) www.cdc.gov, and as required by federal, state, and local requirements.

1.5 MONTHLY EXPOSURE REPORTS

Provide a Monthly Exposure Report by the fifth of each month. 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 progress payment.

1.6 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation Checklist" to the Contractor at the preconstruction conference. Complete the checklist monthly and submit with each request for payment voucher. This submission is required monthly even when a payment voucher is not requested. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90 may result in retention of up to 10 percent of the voucher. The Contractor Safety Self-Evaluation Checklist can be found on the Whole Building Design Guide website at www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-01-35-26

1.7 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, and all applicable federal, state, and local 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.

1.7.1 Subcontractor Safety Requirements

For this Contract, neither Contractor nor any subcontractor may enter into Contract with any subcontractor that fails to meet the following requirements. The term subcontractor in this and the following paragraphs means any entity holding a Contract with the Contractor or with a subcontractor at any tier.

1.7.1.1 Experience Modification Rate (EMR)

Subcontractors on this Contract must have an effective EMR less than or equal to 1.10, as computed by the National Council on Compensation Insurance (NCCI) or if not available, as computed by the state agency's rating bureau in the state where the subcontractor is registered, when entering into a subcontract agreement with the Prime Contractor or a subcontractor at any tier. The Prime Contractor may submit a written request for additional consideration to the Contracting Officer where the specified acceptable EMR range cannot be achieved. Relaxation of the EMR range will only be considered for approval on a case-by-case basis for special conditions and must not be anticipated as tacit approval. Contractor's SSHO must collect and maintain the certified EMR ratings for all subcontractors on the project and make them available to the Government at the Government's request.

1.7.1.2 OSHA Days Away from Work, Restricted Duty, or Job Transfer (DART) Rate

Subcontractors on this Contract must have a DART rate, calculated from the most recent, complete calendar year, less than or equal to 3.4 when entering into a subcontract agreement with the Prime Contractor or a subcontractor at any tier. The OSHA Dart Rate is calculated using the following formula:

(N/EH) x 200,000

Where:

N = number of injuries and illnesses with days away, restricted work, or job transfer

EH = total hours worked by all employees during most recent, complete calendar year

200,000 = base for 100 full-time equivalent workers (working 40-hours per week, 50 weeks per year)

The Prime Contractor may submit a written request for additional consideration to the Contracting Officer where the specified acceptable OSHA Dart rate range cannot be achieved for a particular subcontractor. Relaxation of the OSHA DART rate range will only be considered for approval on a case-by-case basis for special conditions and must not be anticipated as tacit approval. Contractor's SSHO must collect and maintain self-certified OSHA DART rates for all subcontractors on the project and make them available to the Government at the Government's request.

1.8 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

1.8.1 Site Safety and Health Officer (SSHO)

1.8.1.1 Qualifications of SSHO

All SSHOs will have met the training and experience requirements identified in the EM 385-1-1 and this Contract.

1.8.1.2 Duties of SSHO

All SSHOs will carry out the roles and responsibilities as identified in this Contract and the EM 385-1-1. All SSHOs will be designated on an ENG Form 6282, provided 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.

1.8.1.3 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 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.

1.8.2 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 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 APP. 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.

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.

(3) Execute roles and responsibilities identified in EM 385-1-1.

1.8.3 Additional Requirements

The Level Two SSHO may also serve as the QC Manager. The Two SSHO must not serve as the Superintendent.

1.8.4 Competent Person for Confined Space Entry

Provide a CP for Confined Space Entry who meets the requirements of EM 385-1-1 and herein. The CP for Confined Space Entry must supervise the entry into each confined space in accordance with EM 385-1-1.

1.8.5 Qualified Trainer Requirements

Individuals qualified to instruct the 40-hour contract safety awareness course, or portions thereof, must meet the definition of a Competent Person Trainer as defined in the EM 385-1-1, and, at a minimum, possess a working knowledge of the following subject areas: EM 385-1-1, Electrical Standards, Lockout/Tagout, Fall Protection, Confined Space Entry for Construction; Excavation, Trenching and Soil Mechanics; and Scaffolds in accordance with 29 CFR 1926.

Instructors are required to:

a. Prepare class presentations that cover construction-related safety requirements.

b. Ensure that all attendees attend all sessions by using a class roster signed daily by each attendee. Maintain copies of the roster for at least 5 years. This is a certification class and must be attended 100 percent. In cases of emergency where an attendee cannot make it to a session, the attendee can make it up in another class session for the same subject.

c. Update training course materials whenever an update of the EM 385-1-1 becomes available.

d. Provide a written exam of at least 50 questions. Students are required to answer 80 percent correctly to pass.

e. Request, review and incorporate student feedback into a continuous course improvement program.

1.8.6 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, SSHO, QC manager, or any other assigned safety and health professionals who participated in the development of the APP (including the AHAs and special plans, programs, 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.

1.9 ACCIDENT PREVENTION PLAN (APP)

1.9.1 Accident Prevention Plan (APP)

Submit the 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 SOH 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 the APP and ENG Form 6293 APP 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 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 QC 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.

1.9.2 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 SSHO 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.

1.9.3 Plans

Provide plans in the APP in accordance with the requirements outlined in EM 385-1-1, including the following:

1.9.3.1 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.

1.9.3.2 Asbestos Hazard Abatement Plan

Identify the safety and health aspects of asbestos work, and prepare in accordance with Section 02 82 00 ASBESTOS REMEDIATION.

1.9.3.3 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00DECONSTRUCTION and referenced sources. Include engineering survey as applicable.

1.10 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 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.

1.10.1 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.

1.10.2 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.

1.11 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in paragraph REFERENCES. Maintain applicable equipment manufacturer's manuals.

1.12 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.

1.13 NOTIFICATIONS AND REPORTS

1.13.1 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

Table Accident Reporting Required Timeline		
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.

1.13.2 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. Complete the applicable NAVFAC Contractor Incident Reporting System (CIRS), and electronically submit via the NAVFAC Enterprise Safety Applications Management System (ESAMS). Complete and submit an accident investigation report in ESAMS within 7 days for accidents as defined by EM 385-1-1. Complete the investigation report within 30 days. Accidents must include a written report submitted as an attachment in ESAMS using the following outline:

(1) Summary description to include:

(a) Process
(b) Findings
(c) Outcomes

(2) Root Cause

(3) Direct Factors

(4) Indirect and Contributing Factors

(5) Corrective Actions

(6) Recommendations

All accidents are reportable, regardless of whether or not it is recordable.

b. Near Misses: For Navy Projects, complete the applicable documentation in NAVFAC CIRS, and electronically submit via the NAVFAC ESAMS. Near miss reports are considered positive and proactive Contractor safety management actions.

c. Conduct an accident investigation for any Load Handling Equipment (LHE) accident (including rigging accidents) to establish the root cause(s) of the accident. Complete the LHE Accident Report (Crane and

Rigging Accident Report) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

1.13.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

1.13.4 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. Post certifications on the crane.

Develop a Standard Lift Plan (SLP) in accordance with EM 385-1-1 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.

1.14 HOT WORK PERMIT

1.14.1 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 MCAS Cherry Point Fire Department. A permit is required from the Explosives Safety Office for work in and around where explosives are processed, stored, or handled. Contractors are required to meet all criteria before a permit is issued. Provide at least two 20 pound 4A:20 BC rated extinguishers for normal "Hot Work". The extinguishers must be current inspection tagged and contain an 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 must be trained in accordance with NFPA 51B and remain on-site for a minimum of 1 hour after completion of the task or as specified on the hot work permit. For hot work to be performed on a roof, the fire watch must remain on site for a minimum of 2 hours 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 phone number (911). Report any fire, no matter how small, to the MCAS Cherry Point Fire Department immediately.

1.14.2 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.

1.15 RADIATION SAFETY REQUIREMENTS

Submit License Certificates, employee training records, and Leak Test Reports for radiation materials and equipment to the Contracting Officer and Radiation Safety Office (RSO), and Contracting Oversight Technician (COT) for all specialized and licensed material and equipment proposed for use on the construction project (excludes portable machine sources of ionizing radiation including moisture density and X-Ray Fluorescence (XRF)). Maintain on-site records whenever licensed radiological materials or ionizing equipment are on Government property.

Protect workers from radiation exposure in accordance with 10 CFR 20, ensuring any personnel exposures are maintained As Low As Reasonably Achievable.

1.15.1 Radiography Operation Planning Work Sheet

Submit a Gamma and X-Ray Radiography Operation Planning Work Sheet to Contracting Officer 14 days prior to commencement of operations involving radioactive materials or radiation generating devices. For portable machine sources of ionizing radiation, including moisture density and XRF, use and submit the Portable Gauge Operations Planning Worksheet instead. The Contracting Officer and COT will review the submitted worksheet and provide questions and comments.

Contractors must use primary dosimeters process by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

1.15.2 Site Access and Security

Coordinate site access and security requirements with the Contracting Officer and COT for all radiological materials and equipment containing ionizing radiation that are proposed for use on a government facility. For gamma radiography materials and equipment, a Government escort is required for any travels on the Installation. The Navy COT or Government authorized representative will meet the Contractor at a designated location outside the Installation, ensure safety of the materials being transported, and will escort the Contractor for gamma sources onto the Installation, to the job site, and off the Installation. For portable machine sources of ionizing radiation, including moisture density and XRF, the Navy COT or Government authorized representative will meet the Contractor at the job site.

Provide a copy of all calibration records and utilization records to the COT for radiological operations performed on the site.

1.15.3 Loss or Release and Unplanned Personnel Exposure

Loss or release of radioactive materials and unplanned personnel exposures must be reported immediately to the Contracting Officer, RSO, and Base Security Department Emergency Number.

1.15.4 Site Demarcation and Barricade

Properly demark and barricade an area surrounding radiological operations to preclude personnel entrance, in accordance with EM 385-1-1, Nuclear Regulatory Commission, and Applicable State regulations and license requirements, and in accordance with requirements established in the accepted Radiography Operation Planning Work Sheet.

Do not close or obstruct streets, walks, and other facilities occupied and used by the Government without written permission from the Contracting Officer.

1.15.5 Security of Material and Equipment

Properly secure the radiological material and ionizing radiation equipment at all times, including keeping the devices in a properly marked and locked container, and secondarily locking the container to a secure point in the Contractor's vehicle or other approved storage location during transportation and while not in use. While in use, maintain a continuous visual observation on the radiological material and ionizing radiation equipment. In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, make no assumptions as to building occupancy. Where necessary, the Contracting Officer will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, position a fully instructed employee inside the building or area to prevent exiting while external radiographic operations are in process.

1.15.6 Transportation of Material

Comply with 49 CFR 173 for Transportation of Regulated Amounts of Radioactive Material. Notify Local Fire authorities and the site RSO of any Radioactive Material use.

1.15.7 Schedule for Exposure or Unshielding

Actual exposure of the radiographic film or unshielding the source must not be initiated until after 5 p.m. on weekdays.

1.15.8 Transmitter Requirements

Adhere to the base policy concerning the use of transmitters, such as radios and cell phones. Obey Emissions control (EMCON) restrictions.

1.16 CONFINED SPACE ENTRY REQUIREMENTS

Confined space entry must comply with EM 385-1-1, 29 CFR 1926, 29 CFR 1910, and Directive CPL 2.100. Any potential for a hazard in the confined space requires a permit system to be used.

1.16.1 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.

1.17 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.

1.17.1 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.

1.17.1.1 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.

1.17.1.2 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.

1.17.2 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.

1.18 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

2.1 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new permit-required confined spaces. Signs for confined spaces must comply with NEMA Z535.2. Provide signs with wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" in bold letters a minimum of one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" must be red and readable from 5 feet.

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 Use

Each hazardous material must receive approval from the Contracting Office or their designated representative prior to being brought onto the job site or prior to any other use in connection with this Contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material.

3.1.3 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. Notify the RSO prior to excepted items of radioactive material and devices being brought on base.

3.1.4 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 Part 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 15 days in advance and in sufficient time as to not result in impacts or delays to the project schedule. 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. In accordance with EM 385-1-1, where outages involve Government 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 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.

3.3 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. This meeting must include the Prime Contractor, the Prime and subcontractors performing the work, the Contracting Officer, and the Installation Utilities 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. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

3.4 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Provide and operate an HECP in accordance with EM 385-1-1, 29 CFR 1910, 29 CFR 1915, ANSI/ASSP A10.44, NFPA 70E.

3.4.1 Safety Preparatory Inspection Coordination Meeting with the Government Utility

For electrical distribution equipment that is to be operated by Government 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. 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 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 Utility must perform energy isolation verification testing while wearing required PPE detailed in the Contractor's AHA and required by EM 385-1-1. Install personal protective grounds, with tags, to eliminate the potential for induced voltage in accordance with EM 385-1-1.

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, 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 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.

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 (FP&P) 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.

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. 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 3,600 lbs 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 6 feet, 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.

3.6 EQUIPMENT

3.6.1 Use of Explosives

Explosives must not be used or brought to the project site without prior written approval from the Contracting Officer. Such approval does not relieve the Contractor of responsibility for injury to persons or for damage to property due to blasting operations.

Storage of explosives, when permitted on Government property, must be only where directed and in approved storage facilities. These facilities must be kept locked at all times except for inspection, delivery, and withdrawal of explosives.

3.7 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1.

3.7.1 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 1910.

3.7.2 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 State and Local requirements applicable to where work is being performed.

3.7.3 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.

3.7.4 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.

3.7.5 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.

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SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
05/24

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.

ACOUSTICAL SOCIETY OF AMERICA (ASA)
1305 Walt Whitman Road, Suite 110
Melville, NY 11747-4300
Ph: 516-576-2360
Fax: 631-923-2875
E-mail: asa@acousticalsociety.org
Internet: https://acousticalsociety.org/

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: communications@amca.org
Internet: http://www.amca.org

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2311 Wilson Blvd, Suite 400
Arlington, VA 22201
Ph: 703-524-8800
Internet: http://www.ahrinet.org

ALUMINUM ASSOCIATION (AA)
1400 Crystal Drive
Suite 430
Arlington, VA 22202
Ph: 703-358-2960

Internet: https://www.aluminum.org/

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1900 E Golf Rd, Suite 1250
Schaumburg, IL 60173

Ph: 847-303-5664
E-mail: customerservice@FGIAonline.org
Internet: https://fgiaonline.org/

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
555 12th Street NW, Suite 1000
Washington, DC 20004
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: https://www.transportation.org/

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
1001 N. Fairfax Street Suite 500
Alexandria, VA 22314
Ph: 703-842-0030
E-mail: info@americanbearings.org
Internet: https://www.americanbearings.org/

AMERICAN CONCRETE INSTITUTE (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439
Ph: 248-848-3800
Fax: 248-848-3701
Internet: https://www.concrete.org/

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
3640 Park 42 Drive
Cincinnati, OH 45241
Ph: 513-742-2020
Fax: 513-742-3355
Email: customerservice@acgih.org
Internet: https://www.acgih.org/

AMERICAN FOREST FOUNDATION (AFF)
American Tree Farm System
2000 M Street, NW, Suite 550
Washington, DC 20036
Ph: 202-765-3660
Fax: 202-827-7924
Email: info@forestfoundation.org
Internet: https://www.treefarmsystem.org

AMERICAN IRON AND STEEL INSTITUTE (AISI)
25 Massachusetts Avenue, NW Suite 800
Washington, DC 20001
Ph: 202-452-7100
Internet: https://www.steel.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: info@ansi.org
Internet: https://www.ansi.org/

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191
Ph: 800-548-2723; 703-295-6300
Email: customercare@asce.org
Internet: https://www.asce.org/

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
180 Technology Parkway NW
Peachtree Corners, GA 30092
Ph: 404-636-8400 or 800-527-4723
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: https://www.ashrae.org/

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Two Park Avenue
New York, NY 10016-5990
Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: https://www.asme.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 SANITARY ENGINEERING (ASSE)
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448
Ph: 708-995-3019
Fax: 708-479-6139
Internet: http://www.asse-plumbing.org

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 W. Quincy Avenue
Denver, CO 80235 USA
Ph: 303-794-7711 or 800-926-7337
Fax: 303-347-0804
Internet: https://www.awwa.org/

AMERICAN WELDING SOCIETY (AWS)
8669 NW 36 Street, #130
Miami, FL 33166-6672
Ph: 800-443-9353
Email: customercare@aws.org
Internet: https://www.aws.org/

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1015 18th St. NW Suite 603
Washington, DC 20036
Ph: 202-737-0202
Fax: 202-315-0285
E-mail: info@aabc.com
Internet: https://www.aabc.com/

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
E-mail: service@astm.org
Internet: https://www.astm.org/

BACNET TESTING LABORATORIES (BTL)
BACnet Testing Laboratories
2900 Delk Road
Suite 700, PMB 321
Marietta, GA 30067
Ph: 770-971-6003
Fax: 678-229-2777

Internet: https://www.btl.org/

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
529 14th Street NW Suite 1280
Washington, DC 20045
Ph: 212-297-2122
Fax: 212-370-9047
Internet: https://www.buildershardware.com/

CALIFORNIA AIR RESOURCES BOARD (CARB)
1001 I Street
Sacramento, CA 95814
Ph: 800-242-4450
Email: helpline@arb.ca.gov
Internet: https://ww2.arb.ca.gov/

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: https://carpet-rug.org/

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)
1600 Clifton Road
Atlanta, GA 30329-4027
Ph: 800-232-4636
TTY: 888-232-6348
Internet: https://www.cdc.gov

COMPOSITE PANEL ASSOCIATION (CPA)
19465 Deerfield Avenue, Suite 306
Leesburg, VA 20176
Ph: 703-724-1128
Fax: 703-724-1588

Internet: https://www.compositepanel.org/

COMPRESSED GAS ASSOCIATION (CGA)
8484 Westpark Drive Suite 220
McLean, Virginia 22102
Ph: 703-788-2700
Fax: 703-961-1831
E-mail: cga@cganet.com
Internet: https://www.cganet.com/

COPPER DEVELOPMENT ASSOCIATION (CDA)
Internet: https://www.copper.org/

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)
722 Jackson Place
Washington DC 20506
Internet: https://www.whitehouse.gov/administration/eop/ceq

CSA GROUP (CSA)
178 Rexdale Blvd.
Toronto, ON, Canada M9W 1R3
Ph: 416-747-4044
Fax: 416-747-2510
E-mail: member@csagroup.org
Internet: https://www.csagroup.org/

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION (DASMA)
1300 Sumner Avenue
Cleveland, OH 44115-2851
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Fax: 216-241-0105
Email dasma@dasma.com
Internet: https://www.dasma.com/

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)
310 Maxwell Road, Suite 200
Alpharetta, GA 30009
Ph: 678-393-9990
Fax: 678-393-9998
E-mail: emikoski@ecianow.org
Internet: https://www.ecianow.org

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1000 Bruxelle
Belgium
Ph: +32 2 299 96 96
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Fax: 401-275-3029
Internet: https://www.fmglobal.com/

FOREST STEWARDSHIP COUNCIL (FSC)
1441 Woodmont Ln NW #539

Atlanta, GA 30318
Ph: 612-353-4511
E-mail: info@us.fcs.org
Internet: https://us.fsc.org/

GLASS ASSOCIATION OF NORTH AMERICA (GANA)
National Glass Association
1945 Old Gallows Rd., Suite 750
Vienna, VA 22182
Ph: 866-342-5642
Ph: 703-442-4890
Fax: 703-442-0630
Internet: https://www.glass.org/

GREEN SEAL (GS)
601 13th St NW 12th Floor
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E-mail: greenseal@greenseal.org
Internet: https://www.greenseal.org/

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Internet: https://www.ies.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: 732-981-9667
E-mail: onlinesupport@ieee.org
Internet: https://www.ieee.org/

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E-mail: info@icea.net
Internet: https://www.icea.net/

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)
27 N. Wacker Dr. Suite 365
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Internet: https://www.iccsafe.org/

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)
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Portage, MI 49024
Ph: 269-488-6382 or 1-888-300-6382
Fax: 269-488-6383
Internet: https://www.netaworld.org/

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
ISO Central Secretariat
BIBC II
Chemin de Blandonnet 8
CP 401 - 1214 Vernier, Geneva
Switzerland
Ph: 41-22-749-01-11
E-mail: central@iso.ch
Internet: https://www.iso.org

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)
1101 Wilson Blvd, Suite 1425
Arlington, VA 22209-1762
Ph: 703-525-1695
Fax: 703-528-2148
Internet: https://safetyequipment.org/

INTERNET ENGINEERING TASK FORCE (IETF)
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5177 Brandin Court
Fremont, California 94538
Ph: 510-492-4080
Fax: 510-492-4001
E-mail: ietf-info@ietf.org
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
127 Park Street, NE
Vienna, VA 22180-4602
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Internet: http://msshq.org

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Fax: 1-888-211-8708
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Internet: http://www.mpi.net/

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Internet: http://www.naamm.org

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
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Washington, DC 20004
Ph: 202-991-6300
Fax: 202-217-4171
Internet: https://www.necanet.org/

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
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Internet: https://www.nema.org

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Fax: 301-977-9589
Internet: http://www.nebb.org

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Fax: 800-593-6372
Internet: https://www.nfpa.org

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)
Patriots Plaza 1

395 E Street, SW, Suite 9200
Washington, DC 20201
Ph: 800-232-4636
Fax: 513-533-8347
Internet: https://www.cdc.gov/niosh/

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
100 Bureau Drive
Gaithersburg, MD 20899
Ph: 301-975-2000
Internet: https://www.nist.gov/

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
217 West Jones Street
Raleigh, NC 27603
Ph: 877-623-6748
Internet:

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

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)
800 Roosevelt Road
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Glen Ellyn, IL 60137
Ph: 630-858-6540
Fax: 630-790-3095
Internet: https://www.ppfahome.org/

PLUMBING AND DRAINAGE INSTITUTE (PDI)
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E-Mail: pdi@PDIonline.org
Internet: http://www.pdionline.org

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)
10, Route de l'Aeroport
Case Postale 638
1215 Geneva - Switzerland
Ph: +41 (22) 799-4540
Fax: +41 (22) 799-4550
Email: info@pefc.org
Internet: https://www.pefc.org/

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Fax: 510-452-8001
E-mail: info@SCSglobalservices.com
Internet: https://www.scsglobalservices.com/

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Ph: 703-803-2980
Fax: 703-803-3732
Internet: https://www.smacna.org/

SOCIETY FOR PROTECTIVE COATINGS (SSPC)
800 Trumbull Drive
Pittsburgh, PA 15205
Ph: 877-281-7772 or 412-281-2331
Fax: 412-444-3591
E-mail: customerservice@sspc.org
Internet: http://www.sspc.org

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)
400 Commonwealth Drive
Warrendale, PA 15096
Ph: 877-606-7323 or 724-776-4841
Fax: 724-776-0790
E-mail: customerservice@sae.org
Internet: https://www.sae.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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Westlake, OH 44145
Ph: 440-899-0010
Fax: 440-892-1404
E-mail: info@steeldoor.org
Internet: https://www.steeldoor.org/

SUSTAINABLE FOREST INITIATIVE (SFI)
2121 K Street NW
Suite 750
Washington, DC 20037
Ph: 202-596-3450
Fax: 202-596-3451
E-mail: info@sfiprogram.org
Internet: https://forests.org/

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)
15 Technology Parkway South, Suite 115
Peachtree Corners, GA 30092
Ph: 800-332-8686 or 770-446-1400
Fax: 770-446-6947
E-mail: memberconnection@tappi.org
Internet: http://www.tappi.org

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)
1320 North Courthouse Rosd, Suite 200
Arlington, VA 22201

Ph: 703-907-7700
Fax: 703-907-7727
E-mail: marketing@tiaonline.org
Internet: https://www.tiaonline.org/

THE MASONRY SOCIETY (TMS)
105 South Sunset Street, Suite Q
Longmont, CO 80501-6172
Ph: 303-939-9700
Fax: 303-541-9215
E-mail: info@masonrysociety.org
https://masonrysociety.org/

TILE COUNCIL OF NORTH AMERICA (TCNA)
100 Clemson Research Boulevard
Anderson, SC 29625
Ph: 864-646-8453
Fax: 864-646-2821
E-mail: info@tileusa.com
Internet: https://www.tcnatile.com/

TURFGRASS PRODUCERS INTERNATIONAL (TPI)
444 E. Roosevelt Road
#346
Lombard, IL 60148
Ph: 800-405-8873 or 847-649-5555
Fax: 847-649-5678
E-mail: info@turfgrasssod.org
Internet: http://www.turfgrasssod.org

U.S. ARMY CORPS OF ENGINEERS (USACE)
CRD-C DOCUMENTS available on Internet:
http://www.wbdg.org/ffc/army-coe/standards
Order Other Documents from:
Official Publications of the Headquarters, USACE
E-mail: hqpublications@usace.army.mil
Internet: http://www.publications.usace.army.mil/
or
https://www.hnc.usace.army.mil/Missions/Engineering-Directorate/TECHINFO/

U.S. DEFENSE LOGISTICS AGENCY (DLA)
Andrew T. McNamara Building
8725 John J. Kingman Road
Fort Belvoir, VA 22060-6221
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https://www.rd.usda.gov/about-rd/agencies/rural-utilities-service

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Department of Defense Single Stock Point (DODSSP)
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Philadelphia, PA 19111-5094
Ph: 215-697-6396 - for account/password issues
Internet: https://assist.dla.mil/online/start/; account registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
1090 Vermont Avenue NW, Suite 700
Washington, DC 20005
Ph: 202-289-7800
Fax: 202-289-1092
Internet:
https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc

U.S. DEPARTMENT OF ENERGY (DOE)
1000 Independence Avenue Southwest
Washington, D.C. 20585
Ph: 202-586-5000
Fax: 202-586-4403
E-mail: The.Secretary@hq.doe.gov
Internet: https://www.energy.gov/

U.S. DEPARTMENT OF ENERGY FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)
Forrestal Building
1000 Independence Avenue, SW
Washington, DC 20585
Internet:
https://www.energy.gov/eere/femp/federal-energy-management-program

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)
HUD User
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Washington, DC 20026-3268
Ph: 800-245-2691 or 202-708-3178

TDD: 800-927-7589
Fax: 202-708-9981
E-mail: helpdesk@huduser.gov
Internet: https://www.huduser.gov

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Ph: 202-564-4700
Internet: https://www.epa.gov
--- Some EPA documents are available only from:
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5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6060 or 1-800-363-2068
Fax: 703-605-6880
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Washington Navy Yard, DC 20374-5065
Ph: 202-685-9387
Internet: http://www.navfac.navy.mil

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2211 Newmarket Parkway, Suite 106
Marietta, GA 30067
Ph: 888-485-4733
E-mail: environment@ul.com
Internet:
https://www.ul.com/services/portfolios/sustainability-and-environment

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333 Pfingsten Road
Northbrook, IL 60062
Ph: 877-854-3577 or 360-817-5500
E-mail: CustomerExperienceCenter@ul.com
Internet: https://www.ul.com/
UL Directories available through IHS at https://accuristech.com/

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2600 N.W. Lake Road

Camas, WA 98607-8542
Ph: 877-854-3577 or 360-817-5500
E-mail: CustomerExperienceCenter@ul.com
Internet: https://www.ul.com/
UL Directories available through IHS at https://accuristech.com/

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
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3rd Floor North
Washington, DC 20006
Ph: 202-367-1157
or
330 N Wabash Avenue, Suite 2000
Chicago, IL 60611
Ph: 312-321-6802
E-mail: membersupport@wdma.com
Internet: https://www.wdma.com/

WOODWORK INSTITUTE (WI)
1455 Response Road, Suite 110
Sacremento, CA 95815
Ph: 916-372-9943
Fax: 916-372-9950
E-mail: info@woodinst.com
Internet: https://woodworkinstitute.com

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

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SECTION 01 45 00

QUALITY CONTROL
08/23, CHG 1: 05/24

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.

ASTM INTERNATIONAL (ASTM)

ASTM C1077	(2024) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D3666	(2016) Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D3740	(2019) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E329	(2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E543	(2021) Standard Specification for Agencies Performing Non-Destructive Testing

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control (QC) program. Include all associated costs in the applicable Bid Schedule item.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan

SD-06 Test Reports

Verification Statement

SD-07 Certificates

Certificate Of Readiness

1.4 GENERAL REQUIREMENTS

Establish and maintain an effective QC system that complies with FAR 52.246-12 Inspection of Construction. QC is comprised of plans, procedures, and organization necessary to produce an end product that complies with the Contract requirements. The QC system covers all construction operations, both onsite and offsite, and must be keyed to the proposed construction sequence. The QC Manager, Superintendent, Site Safety and Health Officer (SSHO), and all on-site supervisors are responsible for the quality of work and are subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the Contract. The QC Manager must maintain a physical presence at the work site at all times and is the primary individual responsible for all QC.

1.5 QUALITY CONTROL (QC) PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. This QC program is a key element in meeting the objectives of the Commissioning Process (Cx). The QC program consists of a QC Organization, QC Plan, QC Plan Meeting(s), a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, completion inspections, QC certifications, and documentation necessary to provide materials, equipment, workmanship, fabrication, construction, and operations that comply with the requirements of this Contract. The QC program must cover on-site and off-site work and be keyed to the work sequence. No construction work or testing may be performed unless the QC Manager is on the work site. The QC Manager must report to an officer of the firm and not be subordinate to the Project Superintendent or the Project Manager. The QC Manager, Project Superintendent, and Project Manager must work together effectively. Although the QC Manager is the primary individual responsible for QC, all individuals will be held responsible for the quality of work on the job.

1.5.1 Meetings

1.5.1.1 Quality Control Plan Meeting

Prior to submission of the QC Plan, the Contractor may request a meeting with the Contracting Officer to discuss the QC Plan requirements of this Contract.

The purpose of this meeting is to develop a mutual understanding of the QC Plan requirements prior to plan development and submission and to agree on the Contractor's list of Definable Feature of Work (DFOW).

1.5.1.2 Coordination and Mutual Understanding 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 QC system. 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 QC Manager and signed by the Contractor and the Government. Provide a copy of the signed minutes to all attendees and include in the QC Plan. At a minimum the Coordination and Mutual Understanding Meeting must be repeated when a new QC Manager is appointed. There can be other 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.

1.5.1.2.1 Purpose

The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, design intent, Cx in accordance with Section 01 91 00.15 BUILDING COMMISSIONING, environmental requirements and procedures, coordination of activities to be performed, and the coordination of the Contractor's management, production, and QC personnel. At the meeting, the Contractor must explain in detail how three phases of control will be implemented for each DFOW, as well as how each DFOW will be affected by each management plan or requirement as listed below:

a. Waste Management Plan.

b. Procedures for noise and acoustics management.

c. Environmental Protection Plan.

d. Environmental regulatory requirements.

e. Cx Plan requirements in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

f. Indoor Air Quality (IAQ) Management Plan.

1.5.1.2.2 Coordination of Activities

Coordinate activities included in various sections to assure efficient and orderly installation of each component. Coordinate operations included under different sections that are dependent on each other for proper installation and operation. Schedule construction operations with consideration for IAQ as specified in the IAQ Management Plan.

1.5.1.2.3 Attendees

As a minimum, the Contractor's personnel required to attend include an officer of the firm, the Project Manager, Project Superintendent, QC Manager, Alternate QC Manager, QC Specialists, Commissioning Provider (CxC), Environmental Manager, and subcontractor representatives. Each subcontractor who will be assigned QC responsibilities must have a principal of the firm at the meeting.

1.5.1.3 Quality Control (QC) Meetings

After the start of construction, conduct weekly QC meetings led by the QC Manager at the work site with the Project Superintendent, the QC Specialists, CxC, and the other personnel as necessary. The QC Manager is to prepare the minutes of the meeting and provide a copy to the Contracting Officer within 2 working days after the meeting. The Contracting Officer may attend these meetings. As a minimum, accomplish the following at each meeting:

a. Review the minutes of the previous meeting.

b. Review the schedule and the status of work and deficiencies/rework. Review the most current approved schedule (in accordance with schedule specification) and the status of work and deficiencies/rework.

c. Review the status of submittals and Request For Information (RFIs).

d. Review the work to be accomplished in the next 3 weeks as defined by the schedule section paragraph WEEKLY LOOK AHEAD in Section 01 32 16.00 20 SMALL PROJECT CONSTRUCTION PROGRESS SCHEDULES and all documentation required for that work.

e. Review Testing Plan and Log, including status of tests performed since last QC Meeting.

f. Resolve QC and production problems. Discuss status of pending change orders.

g. Address items that may require revising the QC Plan.

h. Review Accident Prevention Plan (APP) and effectiveness of the safety program.

i. Review environmental requirements and procedures.

j. Review Environmental Management Plan.

k. Review Waste Management Plan.

l. Review the status of training completion.

m. Review Cx Plan and progress. Review Issues Log and resolution.

n. Review IAQ Management Plan.

1.5.2 Contractor Quality Control (CQC) Plan

Submit no later than 30 days after Contract Award, the CQC Plan proposed to implement the requirements FAR 52.246-12 Inspection of Construction. Construction will be permitted to begin only after acceptance of the CQC Plan and other Contract requirements

1.5.2.1 Content of Contractor Quality Control (CQC) Plan

Provide a CQC Plan, prior to start of construction, that includes a table of contents, with major sections identified, pages numbered sequentially,

and that documents the proposed methods and responsibilities for accomplishing QC during the construction of the project. The CQC Plan must at a minimum include the following sections:

a. A description of the QC organization and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified.

b. An organizational chart showing the QC organization with individual names and job titles and lines of authority up to an executive of the company at the home office.

c. NAMES AND QUALIFICATIONS: Names and qualifications, in resume format, (including position titles and durations for qualifying experiences) for each person in the QC organization. Include the Construction Quality Management (CQM) for Contractors course certifications for the QC personnel as required by the paragraph CONSTRUCTION QUALITY MANAGEMENT TRAINING.

d. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL: Duties, responsibilities, and authorities of each person in the QC organization.

e. OUTSIDE ORGANIZATIONS: A listing of outside organizations, such as architectural and consulting engineering firms, that will be employed by the Contractor and a description of the services these firms will provide.

f. APPOINTMENT LETTERS: Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager, CxC, and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the three phases of control, and their authority to stop work that is not in compliance with the Contract. Letters of direction are to be issued by the QC Manager to all other QC Specialists or QC representatives outlining their duties, authorities, and responsibilities. Include copies of the letters in the QC Plan.

g. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER: Procedures for reviewing, approving, scheduling, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to submitting for approval. Provide the initial submittal of the Submittal Register as specified in Section 01 33 00 SUBMITTAL PROCEDURES.

h. TESTING LABORATORY INFORMATION: Testing laboratory information required by the paragraph ACCREDITATION REQUIREMENTS, as applicable.

i. TESTING PLAN AND LOG: A Testing Plan and Log that includes the tests required, associated feature of work required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.

j. Procedures to complete construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected. This

phase is performed prior to beginning work on each DFOW, after all required plans, documents, and materials are approved, and after copies are at the work site.

k. Reporting procedures, including proposed reporting formats.

l. Procedures for submitting and reviewing design changes/variations prior to submission to the Contracting Officer.

m. LIST OF DEFINABLE FEATURES: A DFOW is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. A DFOW is identified by different trades or disciplines, or it is work by the same trade in a different environment. A DFOW is by definition any item or activity on the construction schedule, and the schedule specification provides direction regarding how the DFOWs are to be structured. Include in the list of DFOWs for all activities on the Construction Schedule. Although each section of the specifications can generally be considered as a DFOW, there are frequently more than one definable features under a particular section. Identify the specification section number and schedule activity ID for each DFOW listed. The DFOW list will be reviewed in coordination with the construction schedule and agreed upon during the Coordination of Mutual Understanding Meeting.

n. PROCEDURES FOR PERFORMING AND TRACKING THE THREE PHASES OF CONTROL: Identify procedures used to ensure the three phases of control to manage the quality on this project. For each DFOW, a Preparatory and Initial phase checklist will be filled out during the Preparatory and Initial phase meetings. Conduct the Preparatory and Initial Phases and meetings with a view towards obtaining quality construction by planning ahead and identifying potential problems for each DFOW.

o. PROCEDURES FOR COMPLETION INSPECTION: Procedures for identifying and documenting the completion inspection process. Include in these procedures the responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.

p. TRAINING PROCEDURES AND TRAINING LOG: Procedures for coordinating and documenting the training of personnel required by the Contract.

q. ORGANIZATION AND PERSONNEL CERTIFICATIONS LOG: Procedures for coordinating, tracking, and documenting all certifications required for entities such as subcontractors, testing laboratories, suppliers, and personnel. The QC Manager will ensure that certifications are current, appropriate for the work being performed, and will not lapse during any period of the Contract that the work is being performed.

1.5.3 Acceptance of the Quality Control (QC) Plan

The Contracting Officer's acceptance of the Contractor QC Planis required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary, including removal or addition of personnel, to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time to verify the submitted qualifications. All QC organization personnel are subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements

specified in the Contract.

1.5.4 Preliminary Construction Work Authorized Prior to Acceptance

The only construction work that is authorized to proceed prior to the acceptance of the QC Plan is mobilization of storage and office trailers, temporary utilities, and surveying with specific prior approval of the Contracting Officer.

1.5.5 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed changes in the QC Plan or changes to the QC organization personnel. Proposed changes are subject to acceptance by the Contracting Officer.

1.6 QUALITY CONTROL (QC) ORGANIZATION

1.6.1 Quality Control (QC) Manager

1.6.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC program, and to serve as the Level two SSHO as detailed in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The QC Manager must attend the partnering meetings, QC Plan Meetings, Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control except for those phases of control designated to be performed by QC Specialists, perform submittal review and certification, ensure testing is performed, and provide QC certifications and documentation required in this Contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by the QC Specialists, testing laboratory personnel and any other inspection and testing personnel required by this Contract. The QC Manager is the manager of all QC activities.

1.6.1.2 Qualifications

The QC Manager must be an individual with a minimum of 5 years combined experience in the following positions: Project Superintendent, QC Manager, Project Manager, Project Engineer, or Construction Manager on similar size and type construction Contracts which included the major trades that are part of this Contract. The individual must have at least 2 years experience as a QC Manager. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification, safety compliance, and sustainability.

The QC Manager and all members of the QC organization must be capable of reading, writing, and conversing fluently in the English language.

1.6.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager and all members of the QC team must have completed the CQM for Contractors course. If the QC 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 Systems Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

The CQM Training certificate expires after 5 years. If the QC Manager's certificate has expired, retake the course to remain current.

1.6.2 Organizational Changes

Maintain the QC staff with personnel as required by the specification section at all times. When it is necessary to make changes to the QC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

1.6.3 Alternate Quality Control (QC) Manager Duties and Qualifications

Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The period of absence may not exceed 2 weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager must be the same as for the QC Manager.

1.6.4 Commissioning

Commissioning (Cx) is a systematic, quality-focused process for delivery of a project focusing on verifying and documenting all commissioned systems and assemblies are installed, tested, and operating as they were planned and designed to meet the project requirements. The QC requirements outlined in this specification section are key in supporting the objectives of the Cx process, specifically coordinating testing, documenting, and verifying proper system operation. Properly executed the QC support of Cx ensures timely execution of necessary tasks to deliver the fully commissioned and operating systems in coordination with the overall construction and project schedule.

Provide Cx in addition to the QC requirements of this section and not as a substitute for QC requirements. The QC Manager is responsible for carrying out the three phases of control while ensuring the functional performance and integrated systems tests are coordinated with the Cx provider as required for each system to be commissioned.

1.6.4.1 Certificate of Readiness

The QC Manager must issue a Certificate of Readiness for Government approval for each system to be commissioned. Schedule Functional Performance Tests for each system only after the Certificate of Readiness has been approved by the Government for the system. The Certificate of Readiness certifies that all required inspections have been completed and deficiencies that were identified through any prior review, inspection, or test activity have been corrected before the start of Functional Performance Tests. Refer to Cx requirements in Section 01 91 00.15 BUILDING COMMISSIONING for a list of systems to be commissioned and detailed requirements for the Cx provider.

1.6.5 Quality Control (QC) Specialists

Provide a separate QC Specialist at the work site for each of the areas as listed in the Matrix listed below, who must assist and report to the QC Manager and who must have no duties other than their assigned QC duties. These individuals or specialized technical companies are directly employed by the Prime Contractor and cannot be employed by a supplier or subcontractor on this project. QC Specialists must be physically present

at the work site with frequency as indicated in the Experience Matrix below, to participate in the QC Meetings, perform the three phases of control, including participation in Preparatory and Initial Phase meetings, and to perform and document Follow-up inspections as an extension of the QC Manager for each DFOW in their area of responsibility. QC Specialist must assist and be present for training events, and Critical System Acceptance inspections by the Government. Qualification, experience, Area of Responsibility, and frequency of QC surveillance are provided in Matrix listed herein.

Experience Matrix		
1. Area	**2-1. Qualification** **2-2. Experience**	**3-1. Area of Responsibility** **3-2. Frequency**
Fire Protection QC Specialist (FPQC)	Note: See paragraph FIRE PROTECTION QC SPECIALIST (FPQC)	Note: See paragraph FIRE PROTECTION QC SPECIALIST (FPQC)

1.6.5.1 Fire Protection QC Specialist (FPQC)

Provide a Fire Protection Quality Control Specialist (FPQC) within the QC organization to perform QC related activities as specified herein on fire protection and life safety systems installed under this Contract.

1.6.5.1.1 Qualifications

The FPQC must have the following qualifications:

a. Be a registered Professional Engineer (P.E.) licensed by a Licensing Board in the United States, the District of Columbia, Guam, or Puerto Rico, having passed the National Council of Examiners for Engineering and Surveying (NCEES) examination specifically in the discipline of Fire Protection Engineering.

b. Have a minimum of 5 years of Fire Protection Engineering experience on projects of similar relevance and complexity to the fire protection work specified under this Contract.

c. Other than the contractual obligations with the Prime Contractor, the FPQC must have no other business relationship (i.e., employee, owner, partner, operating officer, distributor, salesman, technical representative, family relationship, or financial investment) with the Prime Contractor or subcontractors.

d. Be employed by an independent engineering firm or company. The firm may identify multiple, to a maximum of five, licensed Fire Protection Engineers for the performance of the duties under this Contract but must submit the names and qualifications for Government approval for all individuals identified prior to them performing any work under this Contract. These individuals may not be substituted without prior approval from the Contracting Officer.

1.6.5.1.2 Responsibilities

FPQC duties and responsibilities:

a. Assist in the development of the QC Plan including the Testing Plan and Log and executing the three phases of control for work involving

the installation and testing of fire protection and life safety systems as an extension of the QC Manager.

b. Participate in project QC Meetings. Participate in Preparatory and Initial Phase meetings and perform and Follow-up inspections for work involving the installation and testing of fire protection and life safety systems.

c. Review and certify that all submittals pertaining to fire protection and life safety systems are complete and accurate prior to submission to the Government for approval. The FPQC Specialist is responsible for ensuring submittals are complete and accurate and all corrections have been made prior to submission to the Government. The Government reserves the right to reject any submittal that has not first been reviewed and certified by the FPQC and so marked, in writing, attesting to such review and completeness of the submittal.

d. The Government reserves the right to reject any submittal or construction that is not in compliance to Contract. Government reviews do not relieve the Contractor responsibility for providing adequate QC measures and do not constitute or imply acceptance of Contract variation.

e. Perform construction surveillance in accordance with the Schedule of Fire Protection System Inspections. Construction surveillance includes but is not limited to performing periodic on-site inspections during construction at specified milestones, performing a pre-final inspection of installed systems and witnessing functional testing; and participating and documenting in an on-site final acceptance inspection of fire protection and life safety systems with the Government FPE.

f. Document inspection results on a FPQC report prepared each day inspections are performed. The report must include a description of the visual inspection or observation performed, a written summary of findings, a conclusion on compliance with the Contract documents, and signature of the FPQC Specialist. Forward the FPQC daily report to the QC Manager who must include the report with the submission of their daily QC Report to the Government each day. Every site visit by the FPQC must be documented on a FPQC daily report.

1.6.5.1.3 Schedule of Fire Protection System Inspections

A schedule, prepared by the Fire Protection DOR, which lists each of the required visual inspections and observations required by the FPQC. The schedule is included at the end of this UFGS section.

1.7 SUBMITTAL AND DELIVERABLES REVIEW AND APPROVAL

Procedures for submission, review, certification, and approval of submittals are described in Section 01 33 00 SUBMITTAL PROCEDURES. Procedures must include field verification of relevant dimensions and component characteristics by the QC organization prior to submittal being sent to the Contracting Officer. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the Contract. When Section 01 91 00.15 BUILDING COMMISSIONING is included in the Contract, the submittals required by that sections have to be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

1.8 THREE PHASES OF CONTROL

CQC enables the Contractor to ensure that the construction, including that of subcontractors and suppliers, complies with the requirements of the Contract. At least three phases of control must be conducted by the QC Manager to adequately cover both on-site and off-site work for each definable feature of the construction work as follows:

1.8.1 Preparatory Phase

Document the results of the preparatory phase actions by separate minutes prepared by the QC Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required to meet Contract specifications.

Notify the Contracting Officer at least 2 business days in advance of each preparatory phase meeting. The meeting will be conducted by the QC Manager and attended by the QC Specialists, the Project Superintendent, the CxC, and the foreman responsible for the DFOW. When the DFOW will be accomplished by a subcontractor, that subcontractor's foreman must attend the preparatory phase meeting. This phase is performed prior to beginning work on each DFOW, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. Perform the following prior to beginning work on each DFOW:

a. Review each paragraph of the applicable specification sections, reference codes, and standards. Make available during the prepatory 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 the Contract drawings.

c. Verify that field measurements are as indicated on construction or shop drawings or both before confirming product orders, to minimize waste due to excessive materials.

d. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.

e. Review the testing plan and ensure that provisions have been made to provide the required QC testing.

f. Examine the work area to ensure that the required preliminary work has been completed and complies with the Contract and ensure any deficiencies/rework items in the preliminary work have been corrected and confirmed by the Contracting Officer.

g. Review coordination of product/material delivery to designated prepared areas to execute the work.

h. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data and are properly stored.

i. Check to assure that all materials and equipment have been tested,

submitted, and approved.

j. Discuss specific controls to be used, construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFOW. Ensure any portion of the plan requiring separate Contracting Officer acceptance has been approved.

k. Review the APP and appropriate AHA to ensure that applicable safety requirements are met, and that required Safety Data Sheets (SDS) are submitted.

l. Review the Cx requirements in accordance with Section 01 91 00.15 BUILDING COMMISSIONING and ensure all preliminary work items have been completed and documented.

1.8.2 Initial Phase

Notify the Contracting Officer at least 2 business days in advance of each initial phase. When construction crews are ready to start work on a DFOW, conduct the initial phase with the QC Specialists, the Project Superintendent, and the foreman responsible for that DFOW. Observe the initial segment of the DFOW to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily CQC Report and in the Initial Phase Checklist. Repeat the initial phase for each new crew to work on-site when acceptable levels of specified quality are not being met. Indicate the exact location of initial phase for DFOW for future reference and comparison with follow-up phases. Perform the following for each DFOW:

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 comply with the Contract.

c. Establish level of workmanship and verify that it meets the minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve any workmanship issues.

e. Ensure that testing is performed by the approved laboratory.

f. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.

g. Review project specific work plans (i.e., Cx, HAZMAT Abatement, Stormwater Management) to ensure all preparatory work items have been completed and documented.

1.8.3 Follow-Up Phase

Perform the following for on-going DFOW daily, or more frequently as necessary, until the completion of each DFOW. The Final Follow-Up for any DFOW will clearly note in the daily report the DFOW is completed, and all

deficiencies/rework items have been completed in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST. Each DFOW that has completed the Initial Phase and has not completed the Final Follow-up must be included on each daily report. If no work was performed on that DFOW for the period of that daily report, it must be so noted. Document all Follow-Up activities for DFOWs in the daily CQC Report:

a. Ensure the work, including control testing, complies with Contract requirements until completion of that particular work feature. Record checks in the CQC documentation.

b. Maintain the quality of workmanship required.

c. Ensure that testing is performed by the approved laboratory.

d. Ensure that deficiencies/rework items are being corrected. 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.

e. Do not build upon nor conceal non-conforming work.

f. Assure manufacturers' representatives have performed necessary inspections if required and perform safety inspections.

g. Review the Cx requirements in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

1.8.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW has not started within 45 days of the initial preparatory meeting or has resumed after 45 days of inactivity, or if other problems develop.

1.8.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least 2 weeks prior to the start of the preparatory and initial phases.

1.8.6 Deficiency/Rework Items List

The QC Manager must maintain a list of work that does not comply with the Contract, identifying what items need to be corrected, the activity ID number associated with the item, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected.

The QC Manager reviews the list at each weekly QC Meeting:

a. There is no requirement to report a deficiency/rework item that is corrected the same day it is discovered.

b. No successor task may be advanced beyond the preparatory phase meeting until all deficiencies/rework items have been cleared by the QC Manager and concurred with by the Contracting Officer. This must be confirmed as part of the Preparatory Phase activities.

c. Attach a copy of the "Deficiency/Rework Items List" to the last daily CQC Report of each month.

d. The Contractor is responsible for including those items identified by the Contracting Officer.

e. All deficiencies/rework items must be confirmed as corrected by the QC Manager, and concurred by the Contracting Officer, prior to commencement of any completion inspections per paragraph COMPLETION INSPECTIONS unless specifically exempted by the Contracting Officer.

f. Non-Compliance with these requirements is grounds for removal in accordance with paragraph ACCEPTANCE OF THE QUALITY CONTROL (QC) PLAN.

g. All delays, concurrent or related to failure to manage, monitor, control, and correct deficiencies/rework items are entirely the responsibility of the Contractor and can not be made the subject, or any component of, any request for additional time or compensation.

1.9 TESTING

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 an U.S. Army Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site or within 5 miles. 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 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.

1.9.1 Accreditation Requirements

Construction materials testing laboratories must be accredited by a laboratory accreditation authority and must submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (

ASTM E329, ASTM C1077, ASTM D3666, ASTM D3740, ASTM E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing must meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the Corporate Office.

1.9.2 Laboratory Accreditation Authorities

Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology at https://www.nist.gov/nvlap, the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program at http://www.aashtoresource.org/aap/overview, International Accreditation Services, Inc. (IAS) at https://www.iasonline.org/, U.S. Army Corps of Engineers Materials Testing Center (MTC) at https://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/476661/materials-testing-center/, and the American Association for Laboratory Accreditation (A2LA) program at https://a2la.org/.

1.9.3 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D3740 and ASTM E329.

1.9.4 Test Results

Cite applicable Contract requirements, tests, or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify the Contracting Officer immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results must be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. Furnish a summary report of field tests at the end of each month, in accordance with paragraph DOCUMENTATION AND INFORMATION FOR THE CONTRACTING OFFICER.

1.9.5 Test Reports and Monthly Summary Report of Tests

Furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the Contracting Officer. Attach a copy of the summary report to the last daily CQC Report of each month. Provide a copy of the signed test reports and certifications to the Operation and Maintenance Support Information (OMSI) preparer for inclusion into the OMSI documentation, in accordance with Sections 01 78 23 OPERATION AND MAINTENANCE DATA.

1.10 COMPLETION INSPECTIONS

1.10.1 Punch-Out Inspection

Near the completion of all work or any increment thereof, established by a

completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager must conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings, specifications, and Contract. Include in the punch list any remaining items on the "Deficiency/Rework Items List", that were not corrected prior to the Punch-Out Inspection as approved by the Contracting Officer in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST. Include within the punch list the estimated date by which the deficiencies will be corrected. Provide a copy of the punch list to the Contracting Officer.

The QC Manager, or staff, must make follow-on inspections to ascertain that all deficiencies have been corrected. All punch list items must be confirmed as corrected by the QC Manager and concurred by the Contracting Officer. Once this is accomplished, notify the Government that the facility is ready for the Government "Pre-Final Inspection".

1.10.2 Pre-Final Inspection

The Government and QC Manager will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Pre-Final Punch List" will be documented by the QC Manager as a result of this inspection. The QC Manager will ensure that all items on this list are corrected and concurred by the Contracting Officer prior to notifying the Government that a "Final" inspection with the Client can be scheduled. All items noted on the "Pre-Final" inspection must be corrected and concurred by the Contracting Officer in a timely manner and be accomplished before the Contract completion date for the work, or any increment thereof, if the project is divided into increments by separate completion dates unless exceptions are directed by the Contracting Officer.

1.10.3 Final Acceptance Inspection

Notify the Contracting Officer at least 14 calendar days prior to the date a final acceptance inspection can be held. State within the notice that all items previously identified on the pre-final punch list will be corrected and acceptable, along with any other unfinished Contract work, by the date of the final acceptance inspection. The Contractor must be represented by the QC Manager, the Project Superintendent, and others deemed necessary. Attendees for the Government will include the Contracting Officer, other Government QA personnel, and personnel representing the Client. 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 with the Contract Clause entitled "Inspection of Construction."

1.11 QUALITY CONTROL (QC) CERTIFICATIONS

1.11.1 Contractor Quality Control (CQC) Report Certification

Contain the following statement within the CQC Report: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used, and work performed during this reporting period is in compliance with the Contract drawings and specifications to the best of my knowledge, except as noted in this report."

1.11.2 Completion Certification

Upon completion of work under this Contract, the QC Manager must furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract." Provide a copy of this final QC Certification for completion to the preparer of the Operation & Maintenance (O&M) documentation.

1.11.3 Invoice Certification

Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current and coordinated and attesting that the work for which payment is requested, including stored material, complies with Contract requirements.

1.12 DOCUMENTATION AND INFORMATION FOR THE CONTRACTING OFFICER

1.12.1 Construction Documentation

Reports are required for each day that work is performed and must be attached to the CQC Report prepared for the same day. Maintain current and complete records of on-site and off-site QC program operations and activities. Reports are required for each day work is performed. Account for each calendar day throughout the life of the Contract.

The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The reporting of work must be identified by terminology consistent with the construction schedule. In the "Remarks" sections of the reports, enter pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered, a record of visitors to the work site, QC problem areas, deviations from the QC Plan, construction deficiencies encountered, and meetings held. For each entry in the report(s), identify the Schedule Activity No. that is associated with the entered remark.

1.12.2 Quality Control Activities

CQC and Contractor Production reports will be prepared daily to maintain current records providing factual evidence that required QC 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 Contractors and any subcontractors.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When a Network Analysis Schedule (NAS) is used, identify each item of work performed each day by NAS activity number.

d. Control phase activities performed. Preparatory and Initial Phase Checklists associated with the DFOW referenced to the construction schedule. Follow-up phase activities identified to the DFOW. If

testing or specific QC Specialist activities are associated with the Follow-up phase activities for a specific DFOW note this and include those reports.

e. Test and control activities performed with results and references to specifications and drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST.

f. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications and drawings requirements.

g. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.

h. Offsite surveillance activities, including actions taken.

i. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

j. Instructions given/received and conflicts in plans and specifications.

1.12.3 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 by 10:00 AM the next working day after the date covered by the report. 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 QC Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the QC Manager Report.

1.12.4 Reports from the Quality Control (QC) Specialist(s)

Document inspection results on a QC specialist report prepared each day work is performed in their area of responsibility. The report must include a description of the visual inspection or observation performed, a written summary of findings, a conclusion on compliance with the Contract documents, and signature of the QC Specialist. In person inspections must be documented with Video/photographs. Video/photographic documentation of deficiencies must include before and after conditions and physical measurements, as necessary. Forward the QC daily report to the QC Manager who must include the report with the submission of their daily QC Report to the Government each day. Every site visit by the QC Specialist must be documented on a QC Specialist daily report.

1.12.5 Quality Control Validation

Establish and maintain the following in an electronic folder. Divide

folder into a series of tabbed sections as shown below. Ensure folder is updated at each required progress meeting.

a. CQC Meeting minutes in accordance with paragraph QUALITY CONTROL (QC) MEETINGS.

b. All completed Preparatory and Initial Phase Checklists, arranged by specification section, further sorted by DFOW referenced to the construction schedule. Submit each individual Phase Checklist the day the phase event occurs as part of the CQC daily report.

c. All milestone inspections, arranged by Activity Number referenced to the construction schedule.

d. An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section referenced to the DFOW to which individual reports results are associated. Individual field test reports will be submitted within 2 working days after the test is performed in accordance with the paragraph QUALITY CONTROL ACTIVITIES. Monthly Summary Report of Tests: Submit the report as an electronic attachment to the CQC Report at the end of each month.

e. Copies of all Contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.

f. An up-to-date copy of the paragraph DEFICIENCY/REWORK ITEMS LIST.

g. Cx documentation in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

h. Upon commencement of Completion Inspections of the entire project or any defined portion, maintain up-to-date copies of all punch lists issued by the QC staff to the Contractor and subcontractors and all punch lists issued by the Government in accordance with the paragraph COMPLETION INSPECTIONS.

1.12.6 Testing Plan and Log

As tests are performed, the CxC and the QC Manager will record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Contracting Officer. Attach a copy of the updated "Testing Plan and Log" to the last daily CQC Report of each month. Provide a copy of the final "Testing Plan and Log" to the preparer of the O&M documentation.

1.12.7 As-Built Drawings

The QC Manager must ensure the as-built drawings, required by Section 01 78 00 CLOSEOUT SUBMITTALS, are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. The as-built drawings document commences with the QC Manager ensuring all amendments, or changes to the Contract prior to Contract award are accurately noted in the initial document set creating the accurate baseline of the Contract prior to any work starting. Ensure each deviation has been identified with the appropriate modifying documentation (e.g., PC No., Modification No., Request for Information No.). The QC Manager or QC Specialist assigned to an area of responsibility must initial each revision. Upon completion of work, the QC Manager will furnish a certificate attesting to the accuracy of the as-built drawings

prior to submission to the Contracting Officer.

1.13 NOTIFICATION ON NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, is deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may 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 a claim for extension of time for excess costs or damages by the Contractor.

1.14 DELIVERY, STORAGE, AND HANDLING

Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials, products, and accessories covered and off the ground, and store in a dry, secure area. Prevent contact with material that may cause corrosion, discoloration, or staining. Protect all materials and installations from damage by the activities of other trades.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SCHEDULE OF FIRE PROTECTION SYSTEM INSPECTIONS BY FPQC SPECIALIST

1. INSTRUCTIONS for FPQC Specialist:

Perform surveillance of fire protection system installation during construction and during pre-final and final acceptance inspections. Surveillance includes either visual inspections or observations performed by the FPQC as indicated in the following Schedule of Fire Protection System Inspections. Check boxes in the schedule indicate the inspections or observations that are applicable to this project, which must be performed and documented by the FPQC.

Surveillance of fire protection system inspections is divided into three phases:

Surveillance During Construction – Includes periodic on-site visits by the FPQC during construction

Pre-Final Acceptance Inspection – FPQC must be onsite during pre-final acceptance inspection

Final Acceptance inspection – FPQC must be onsite during final acceptance inspection

2. INSPECTION TYPE

VISUAL INSPECTION:

Perform on-site visual inspections as indicated in the Schedule of Fire Protection System Inspections as construction progresses to confirm work conforms with the contract requirements including but not limited to verifying proper installation of equipment and materials in accordance with applicable codes. Where work will be covered up by finished walls and ceilings, inspections must be scheduled and performed when work is still visible.

OBSERVATION:

Observe component and system testing in person on-site as indicated in the Schedule of Fire Protection System Inspections. Confirm testing is completed in accordance with applicable codes and that testing was successful.

DOCUMENTATION:

Document all inspections and observations in the FPQC Report in accordance with UFGS 01 45 00. Document any deficiencies and all work observed that has been successfully performed in accordance with the contract documents. Record deficiencies in the rework list.

SCHEDULE OF FIRE PROTECTION SYSTEM INSPECTIONS BY FPQC SPECIALIST

PERFORM SURVEILLANCE DURING CONSTRUCTION

~ FIRE SUPPRESSION SYSTEM ~

PERFORM TASK IF CHECKED	TASK	INSPECTION TYPE	DESCRIPTION
☐	1. Verify proper installation of underground service main and service; laterals, thrust blocks, tie-rods and connection to above ground piping.	**VISUAL INSPECTION**	✓ Visually inspect materials ✓ Visually inspect installation
☐	2. Verify proper orientation of fire hydrants and fire department access	**VISUAL INSPECTION**	✓ Visually inspect installation and orientation
☐	3. Verify proper installation of interior and exterior attachments, coatings, and vortex plate prior to filling fire protection water tank	**VISUAL INSPECTION**	✓ Visually inspect fire protection water tank installation
☐	4. Hydrostatic/leak test for underground piping	**OBSERVE**	✓ Verify proper test method ✓ Confirm test was successful
☒	5. Hydrostatic/leak test for above ground piping prior to ceiling installation	**OBSERVE**	✓ Verify proper test method ✓ Confirm test was successful
☐	6. Underground system flush prior to connection to the riser	**OBSERVE**	✓ Verify system was properly flushed
☐	7. Forward flow test for Backflow preventer	**OBSERVE**	✓ Verify proper test method ✓ Confirm test was successful
☐	8. Suction pipe flush prior to fire pump startup	**OBSERVE**	✓ Verify system was properly flushed
☐	9. Hydrostatic test fire pump suction and discharge piping	**OBSERVE**	✓ Verify proper test method ✓ Confirm test was successful
☐	10. Fire pump startup	**OBSERVE**	✓ Confirm successful startup
☐	11. Verify proper installation of sprinkler piping prior to wall or ceiling installation	**VISUAL INSPECTION**	✓ Inspect pipe hangars, bracing, sprinkler heads ✓ Inspect for sprinkler obstructions; damaged, painted or covered heads ✓ Verify proper location of control valves, drains, vents, backflow, test header ✓ Verify proper component mounting heights
☒	12. Document inspections and observations in FPQC Report	**DOCUMENT**	✓ Submit report for each day inspections or observations occur ✓ Annotate deficiencies and satisfactory work observed ✓ Record rework items in FPQC report

SCHEDULE OF FIRE PROTECTION SYSTEM INSPECTIONS BY FPQC SPECIALIST

~ SPECIAL FIRE SUPPRESSION SYSTEM ~

PERFORM TASK IF CHECKED	TASK	INSPECTION TYPE	DESCRIPTION
☐	1. Verify proper installation of gaseous fire suppression system	**VISUAL INSPECTION**	✓ Inspect gas cylinders, initiating controls, shutdowns, aborts, and visual warning
☐	2. Verify proper installation of IR hangar detector	**VISUAL INSPECTION**	✓ Inspect detector and nozzle layout ✓ Inspect for obstructions, abort stations ✓ Inspect riser piping
☐	3. Verify proper installation of elevator fire protection	**VISUAL INSPECTION**	✓ Inspect elevator recall functions ✓ Inspect two-way communication
☐	4. Verify proper installation of fire suppression in secure spaces	**VISUAL INSPECTION**	✓ Inspect location of sprinkler piping and sprinklers
☐	5. Document inspections and observations in FPQC Report	**DOCUMENT**	✓ Submit report for each day inspections or observations occur ✓ Document deficiencies and satisfactory work observed in FPQC Report ✓ Record deficiencies in rework list

~ PASSIVE FIRE PROTECTION SYSTEMS ~

PERFORM TASK IF CHECKED	TASK	INSPECTION TYPE	DESCRIPTION
☒	1. Verify proper construction of fire rated assemblies	**VISUAL INSPECTION**	✓ Inspect partitions for proper fire rated construction per design ✓ Inspect doors and door hardware for proper fire rating ✓ Inspect glass for proper fire rating
☐	2. Verify proper installation of fireproofing	**VISUAL INSPECTION**	✓ Inspect for use of proper fireproofing materials ✓ Inspect for cracking, spalling or delaminating ✓ Inspect for proper application thickness
☒	3. Verify proper installation of firestopping	**VISUAL INSPECTION**	✓ Inspect to confirm firestopping system is UL tested or an engineering judgement has been obtained and submitted ✓ Inspect for use of proper firestopping materials ✓ Inspect penetrations through fire rated walls, partitions and ceilings ✓ Inspect construction joints and gaps
☒	4. Document inspections and observations in FPQC Report	**DOCUMENT**	✓ Submit report for each day inspections or observations occur

SCHEDULE OF FIRE PROTECTION SYSTEM INSPECTIONS BY FPQC SPECIALIST

			✓ Document deficiencies and satisfactory work observed in FPQC Report ✓ Record deficiencies in rework list
~ FIRE ALARM SYSTEMS ~			
PERFORM TASK IF CHECKED	TASK	INSPECTION TYPE	DESCRIPTION
☒	1. Verify proper installation of fire alarm system after conduit is installed and wiring pulled, but before devices are installed	**VISUAL INSPECTION**	✓ Inspect conduit, wiring, conduit fill, wire type ✓ Inspect installation heights of back boxes
☒	2. Document inspections and observations in FPQC Report	**DOCUMENT**	✓ Submit report for each day inspections or observations occur ✓ Document deficiencies and satisfactory work observed in FPQC Report ✓ Record deficiencies in rework list

~ END OF SURVEILLANCE DURING CONSTRUCTION SECTION

PERFORM DURING PRE-FINAL ACCEPTANCE INSPECTION

PERFORM TASK IF CHECKED	TASK	INSPECTION TYPE	DESCRIPTION
☒	1. Inspect all fire protection systems and all life safety features	**VISUAL INSPECTION**	✓ Verify proper installation of fire protection and life safety systems
☒	2. Witness functional testing of all fire protection and life safety systems	**OBSERVE**	✓ Verify proper testing is performed on fire protection and life safety systems
☒	3. Identify deficiencies that require correction	**VISUAL INSPECTION**	✓ Document deficiencies in FPQC Report and record in rework list
☒	4. Verify rework items have been corrected	**VISUAL INSPECTION**	✓ Record re-inspection results on FPQC Report
☒	5. Document results of pre-final inspection and photograph unsatisfactory conditions	**DOCUMENT**	✓ Document results of pre-final inspection in FPQC Report
☒	6. Certify installation and operation of all fire protection and life safety systems conform to the contract documents	**DOCUMENT**	✓ Provide separate letter certifying conformance with contract requirements

~ END OF PRE-FINAL INSPECTION SECTION

SCHEDULE OF FIRE PROTECTION SYSTEM INSPECTIONS BY FPQC SPECIALIST

PERFORM DURING FINAL ACCEPTANCE INSPECTION

PERFORM TASK IF CHECKED	TASK	INSPECTION TYPE	DESCRIPTION
☒	1. Verify proper installation and operation of all fire protection systems and all life safety features	**VISUAL INSPECTION**	✓
☒	2. Note any deficiencies identified by Government FPE on deficiency list	**DOCUMENT**	✓ Document deficiencies identified by Government FPE on deficiency list
☒	3. Verify all deficiencies have been corrected	**VISUAL INSPECTION**	✓ Inspect rework to confirm all deficiencies have been corrected
☒	4. Certify that all deficiencies have been corrected	**DOCUMENT**	✓ Document inspection results on FPQC Report

~ END OF FINAL ACCEPTANCE INSPECTION SECTION

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SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
11/20, CHG 3: 08/24

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	(2017; R 2021) Reduced-Pressure Principle Backflow Prevention Assembly

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 241	(2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009; Rev 2012) Manual on Uniform Traffic Control Devices

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan
Traffic Control Plan
Haul Road Plan
Contractor Computer Cybersecurity Compliance Statements
Contractor Temporary Network Cybersecurity Compliance Statements

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification
Backflow Preventers Certificate of Full Approval

1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit for Government approval 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

1.4.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or 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 a company participating in other phases of this Contract.

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or 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 DOD CONDITION OF READINESS (COR)

DOD will set the Condition of Readiness (COR) based on the weather forecast for sustained winds 50 knots (58 mph) or greater. Contact the Contracting Officer for the current COR setting.

Monitor weather conditions a minimum of twice a day and take appropriate actions according to the approved Emergency Plan in the accepted Accident Prevention Plan, EM 385-1-1 Emergency Plan requirements, and the instructions below.

Unless otherwise directed by the Contracting Officer, comply with:

a. Condition FOUR (Sustained winds of 58 mph or greater expected within 72 hours): Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 3.3 feet high. Remove all debris, trash, or objects that could become missile hazards. Review requirements pertaining to "Condition THREE" and continue action as necessary to attain "Condition FOUR" readiness. Contact Contracting Officer for weather and COR updates and completion of required actions.

b. Condition THREE (Sustained winds of 58 mph or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might

interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Reinforce or remove formwork and scaffolding. Secure machinery, tools, equipment, materials, or remove from the jobsite. Expend every effort to clear all missile hazards and loose equipment from general base areas. Contact Contracting Officer for weather and COR updates and completion of required actions. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness.

c. Condition TWO (Sustained winds of 58 mph or greater expected within 24 hours): Secure the jobsite, and leave Government premises.

d. Condition ONE. (Sustained winds of 58 mph or greater expected within 12 hours): Contractor access to the jobsite and Government premises is prohibited.

1.6 CYBERSECURITY DURING CONSTRUCTION

{For Reference Only: This subpart (and its subparts) relates to AC-18, SA-3, CCI-00258.} Meet the following requirements throughout the construction process.

1.6.1 Contractor Computer Equipment

Contractor owned computers may be used for construction. When used, contractor computers must meet the following requirements:

1.6.1.1 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.

1.6.1.2 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. All computers used on this project must be scanned using the installed software at least once per day.

1.6.1.3 Passwords and Passphrases

The passwords and passphrases for all computers 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.

1.6.1.4 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-01-50-0 Each Statement must be signed by a cybersecurity representative for the

relevant company.

1.6.2 Temporary IP Networks

Temporary Contractor-installed IP networks may be used during construction. Provide Government access to Contractor-furnished temporary IP networks during construction. When used, temporary contractor-installed IP networks must meet the following requirements:

1.6.2.1 Network Boundaries and Connections

The network must not extend outside the project site and must not connect to any IP network other than IP networks provided under this project or Government-furnished IP networks provided for this purpose. Any and all network access from outside the project site is prohibited.

1.6.3 Government Access to Network

Government personnel, as defined, prescribed, and identified by the Contracting Officer, must be allowed to have complete and immediate access to the network at any time in order to verify compliance with this specification. If there is a Government agency responsible for network access, identify that agency.

1.6.4 Temporary Wireless IP Networks

1.6.4.1 Contractor Provided Wi-Fi Network

Provide standalone Wi-Fi network for authorized Government personnel. Network access must be available throughout the jobsite and for the entire Contract period. The Government will use the Wi-Fi service for coordination in the field and related activities. Do not attach or connect the temporary Wi-Fi network to Government networks or systems unrelated to construction activities.

Password information must adhere to requirements outlined in Paragraph PASSWORDS AND PASSPHRASES. Provide password and Wi-Fi network name (SSID) to the Contracting Officer for Government personnel access. Wi-Fi performance must be capable of handling bandwidth to support Government and Contractor activities, including drawing and model access onsite. Provide a point of contact for reporting Wi-Fi outages.

1.6.4.2 Temporary Wireless IP Networks Security

In addition to the other requirements on temporary IP networks, temporary wireless IP (WiFi) networks must not interfere with existing wireless network and must use WPA2 security. Network names (SSID) for wireless networks must be changed from their default values.

1.6.5 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.

1.6.6 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-01-50-0 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.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Prior to the commencement of work activities, provide a clear weatherproof covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the Contract, Wage Rate Information poster, Safety and Health Information as required by EM 385-1-1, and other information approved by the Contracting Officer. Coordinate requirements herein with 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, and in a location as approved by the Contracting Officer.

2.1.2 Warning Signs

Post temporary signs, tags, and labels to give workers and the public adequate warning and caution of construction hazards according to the EM 385-1-1. Attach signs to the perimeter fencing every 150 feet warning the public of the presence of construction hazards. Signs must require unauthorized persons to keep out of the construction site. Correct the data required by safety signs daily. Post signs at all points of entry designating the construction site as a hard hat area.

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 in accordance with EM 385-1-1. Construct with suitable grades and widths; avoid sharp curves, blind corners, and dangerous cross traffic. Submit haul road plan for approval. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and haul 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. Barricades are required 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. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.3 FENCING

Provide fencing along the construction site and at all open excavations and tunnels to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic. All fencing must meet the requirements of EM 385-1-1. Remove the fence upon completion and acceptance of the work.

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary to maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.2 Chain Link Panel Fencing

Temporary panel fencing must be galvanized steel chain link panels 6 feet high. Multiple fencing panels may be linked together at the bases to form long spans as needed. Each panel base must be weighted down using sand bags or other suitable materials in order for the fencing to withstand anticipated winds while remaining upright. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.4 TEMPORARY WIRING

Provide temporary wiring in accordance with EM 385-1-1, NFPA 241, and NFPA 70. Include monthly inspection and testing of all equipment and apparatus.

2.5 BACKFLOW PREVENTERS

Certificate of Full Approval from FCCCHR List, University of Southern California, 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 is not acceptable.

Reduced pressure principle type conforming to the applicable requirements of AWWA C511. Provide backflow preventers complete with flanged ductile iron, bronze, or brass mounted gate valve and strainer, and stainless steel or bronze internal parts.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction Contract employees must park privately owned vehicles in an area designated by the Contracting Officer. Employee parking must not interfere with existing and established parking requirements of the Government installation.

3.2 AVAILABILITY AND USE OF UTILITY SERVICES

3.2.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.2.2 Payment for Utility Services

a. The Government will make all reasonably required utilities available from existing outlets and supplies, as specified in the Contract. Unless otherwise provided in the Contract, the amount of each utility service consumed will be charged to or paid at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. Carefully conserve utilities furnished without charge.

b. Reasonable amounts of the following utilities will be made available without charge or at the prevailing rates:

Utility Services
Electricity
Potable Water
Sanitary Sewer

c. The point at which the Government will deliver such utilities or services and the quantity available must be coordinated with the Contracting Officer. Pay all costs incurred in connecting, converting, and transferring the utilities to the work. Make connections, including providing backflow-preventing devices on connections to domestic water lines; providing meters; and providing transformers; and make disconnections. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.

3.2.3 Meters and Temporary Connections

Provide and maintain necessary temporary connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. Notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. Do not make the final electrical connection.

3.2.4 Advance Deposit

An advance deposit for utilities consisting of a minimum of $300.00 by certified check payable to the U.S. Treasury will be required. The last monthly bill for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed prior to the end of the current fiscal year.

3.2.5 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. Then remove all the temporary distribution lines, meter bases, and associated appurtenances. Pay all outstanding utility bills before final acceptance of the work by the Government.

3.2.6 Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities in accordance with EM 385-1-1. Locate the facilities behind the construction fence or out of the public view. Clean units and empty wastes at least once a week or more frequently into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into a municipal, district, or commercial sanitary sewer system. Penalties or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

3.2.7 Telephone

Make arrangements and pay all costs for telephone facilities desired. Contact Century Link to arrange telephone service if desired. The Station Telephone Officer, located in Building 4397, may need to be contacted if excess phone lines are not available in the area.

3.2.8 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.

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close a thoroughfare or interfere with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan for Government approval detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Make all notifications and obtain all permits required for modification to traffic movements outside Station's jurisdiction. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

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. Provide, erect, and maintain, at Contractor's expense, lights, barriers, signals, passageways, detours, Life Safety Signage, overhead protection, and other items that may be required by the authority having jurisdiction.

d. Provide cones, signs, barricades, lights, or other traffic control devices and personnel required to control traffic. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

3.3.2 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, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Provide self-illuminated (lighted) barricades during hours of darkness. All personnel working in roadways will wear brightly-colored vests or other high visibility apparel in accordance with EM 385-1-1. 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 damage to roads caused by construction operations.

3.3.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations for MCAS Cherry Point without notification to and approval by the Contracting Officer.

3.3.4 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Coordinate dust control methods with 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.4 REDUCED PRESSURE BACKFLOW PREVENTERS

Provide an approved reduced pressure backflow prevention assembly at each location where the Contractor taps into the Government potable water supply.

Perform backflow preventer tests using test equipment, procedures, and certification forms conforming to those outlined in the latest edition of the Manual of Cross-Connection Control published by the FCCCHR Manual. Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use) and quarterly thereafter. Tag must contain the following information: make, model, serial number, dates of tests, results, maintenance performed, and signature of tester. Record test results on certification forms conforming to requirements cited earlier in this paragraph.

3.5 CONTRACTOR'S TEMPORARY FACILITIES

Contractor is responsible for security of their property. Provide adequate outside security lighting at the temporary facilities. Trailers must be anchored to resist high winds and meet applicable state or local standards for anchoring mobile trailers. Coordinate anchoring with EM 385-1-1. The Contract Clause entitled "FAR 52.236-10, Operations and Storage Areas" and the following apply:

3.5.1 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.

In the event a new building is constructed for the temporary project field office, it must be a minimum 12 feet in width, 16 feet in length and have a minimum of 7 feet headroom. Equip the building with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. Provide a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building must be waterproof, supplied with a heater, have a minimum of two doors, electric lights, a telephone, a battery-operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Provide approved sanitary facilities. Screen the windows and doors and provide the doors with deadbolt type locking devices or a padlock and heavy-duty hasp bolted to the door. Door hinge pins must be non-removable. Arrange the windows to open and to be securely fastened from the inside. Protect glass panels in windows by bars or heavy mesh screens to prevent easy access. In warm weather, provide air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is 95 degrees F. Unless otherwise directed by the Contracting Officer, remove the building from the site upon completion and acceptance of the work.

3.5.2 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Include plastic strip inserts so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. 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 the current 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.

Keep fencing in a state of good repair and proper alignment. If the Contractor elects to traverse grassed or unpaved areas which are not established roadways with construction equipment or other vehicles, cover the grassed or unpaved areas with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established

roadways; gravel gradation must be at the Contractor's discretion. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, structures, under trailers, and in areas not accessible to mowers must be edged or trimmed neatly.

3.5.3 Supplemental Storage Area

Upon request, and pending availability, the Contracting Officer will designate another or supplemental area for the 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. Maintain the area in a clean and orderly fashion and secured if needed to protect supplies and equipment. Utilities will not be provided to this area by the Government.

3.5.4 Appearance of Trailers

a. Trailers must be roadworthy and comply with all appropriate state and local vehicle requirements. Trailers which are rusted, have peeling paint, or are otherwise in need of repair will not be allowed on Installation property. Trailers must present a clean and neat exterior appearance and be in a state of good repair.

b. Maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal at the Contractor's expense.

3.5.5 Safety Systems

Protect the integrity of all installed safety systems or personnel safety devices. Obtain prior approval from the Contracting Officer if entrance into systems serving safety devices is required. 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.

3.5.6 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.

3.5.6.1 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 PLANT COMMUNICATIONS

Whenever the individual elements of the plant are located so that

operation by normal voice between these elements is not satisfactory, install a satisfactory means of communication, such as telephone or other suitable devices, and make available for use by Government personnel.

3.7 TEMPORARY PROJECT SAFETY 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 fencing at the work site. Maintain the safety fencing during the life of the Contract and, upon completion and acceptance of the work, remove from the work site.

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 all 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 all other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence. Restore areas used during the performance of the Contract 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.

-- End of Section --

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS
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.

MCAS CHERRY POINT

ASO 5090.13A	Solid Waste Disposal
ASO 5090.14	Post Construction Stormwater Program
ASO 5090.3B	Environmental Compliance Coordinators
ASO 5090.5B	Hazardous Waste
ASO 5090.7A	Spill Prevention, Control, and Countermeasures
MCASCPICP	MCAS Cherry Point Integrated Contingency Plan

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY

NCG010000	North Carolina Construction General Permit
NCESCDM	North Carolina Erosion and Sedimentation Control Design Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1053	Respirable Crystalline Silica
29 CFR 1910.1200	Hazard Communication
29 CFR 1926.1153	Respirable Crystalline Silica
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
40 CFR 82	Protection of Stratospheric Ozone
40 CFR 112	Oil Pollution Prevention

40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 261.7	Residues of Hazardous Waste in Empty Containers
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.11	Hazardous Waste Determination and Recordkeeping
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 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards for Universal Waste Management
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 273.6	Applicability - Aerosol Cans
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances

	Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
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 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

1.2.2 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.

1.2.3 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.4 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.

1.2.5 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.

1.2.6 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 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.7 Hazardous Materials

Hazardous material is any material that: Is defined in 49 CFR 171, listed in 49 CFR 172, regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.1200; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibits a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D, or meets a state or local definition of a hazardous waste.

1.2.9 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, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by municipalities or installations to obtain NPDES permit coverage for their stormwater discharges.

1.2.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily waste also means materials, including wastewaters, centrifuge solids, filter residues or sludges, 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 other state and local 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 other state regulations or local ordinances; 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.

1.2.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.14.1 Sedimentation

The process by which sediment resulting from accelerated erosion has been or is being transported off the site of the land-disturbing activity.

1.2.14.2 Stabilization

Per NCDEQ, the use of engineered structures, vegetation, seeding, or land management practices to provide protection of disturbed areas and to render the surface stable against accelerated erosion and sediment movement.

1.2.14.2.1 Temporary Stabilization

Temporary Stabilization is achieved with 80% coverage per the NCG010000, under Part 5 definitions.

1.2.14.2.2 Permanent Stabilization

Permanent Stabilization is achieved when vegetative cover with a density of at least 80% or covered with a structure stabilization method per the

NCG010000, under Part 5 definitions.

1.2.14.3 Turbidity

The measure of water clarity dependent on how much material suspended in water decreases the passage of light through the water. Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes, and other substances. Per NCG010000, no sediment shall leave the site.

1.2.15 Solid Waste

Solid waste is a solid, liquid, semi-solid, or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch 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; or roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories, and weldments. 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.

1.2.15.2 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.

1.2.15.3 Material Not Regulated As Solid Waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 261.

1.2.15.5 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 be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.15.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.15.7 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.

1.2.15.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, and 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.

1.2.16 Stockpile

A pile or storage of materials that are temporarily stored on site for future use. Select stockpile location to avoid slopes, natural drainageways, and traffic routes. Use sediment fences or other barriers where necessary to retain sediment. Protect topsoil stockpiles by temporarily seeding as soon as possible, no more than 21 days after formation of the stockpile.

1.2.17 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, or creeks meeting the definition of "waters of the United States". Surface discharges from construction sites are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.18 Wastewater

Wastewater is the used water and solids that flow through a sanitary sewer to a treatment plant.

1.2.18.1 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.

1.2.19 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.20 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.

1.2.21 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey
Regulatory Notifications
Environmental Manager Qualifications
Employee Training Records
Environmental Protection Plan
Dirt and Dust Control Plan
Solid Waste Management Permit

Spill Prevention Control And Countermeasure (SPCC) Plan

SD-06 Test Reports

Monthly Solid Waste Disposal Report

SD-07 Certificates

ECATTS Certificate Of Completion
Employee Training Records

SD-11 Closeout Submittals

Regulatory Notifications
Assembled Employee Training Records
Solid Waste Management Permit

As-Built Certifications for Permitting Closeout
Waste Determination Documentation
Project Solid Waste Disposal Documentation Report
Sales Documentation
Hazardous Waste/Debris Management
Disposal Documentation for Hazardous and Regulated Waste
Contractor Hazardous Material Inventory Log

1.4 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 federal, state, and local regulations pertaining to the environment, including 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. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Training in Environmental Compliance Assessment Training and Tracking System (ECATTS)

1.4.1.1 Personnel Requirements

The Environmental Manager is responsible for environmental compliance on projects. The Environmental Manager must complete applicable ECATTS training modules (installation specific or general) prior to starting respective portions of on-site work under this Contract. If personnel changes occur after starting work, replacement personnel must complete applicable ECATTS training within 14 days of assignment to the project.

1.4.1.2 Certification

Submit an ECATTS certificate of completion for personnel who have completed the required ECATTS training. This training is web-based and can be accessed from any computer with Internet access using the following instructions.

Register for NAVFAC ECATTS by logging on to https://environmentaltraining.ecatts.com/. Obtain the password for registration from the Contracting Officer.

1.4.1.3 Refresher Training

This training has been structured to allow contractor personnel to receive credit under this contract and to carry forward credit to future contracts. Ensure the Environmental Manager review their training plans for new modules or updated training requirements prior to beginning work. Some training modules are tailored for specific state regulatory requirements; therefore, Contractors working in multiple states will be required to retake modules tailored to the state where the contract work

is being performed.

1.4.2 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.

1.4.2.1 Required Training

Conformance with the installation's EMS program. The COntractor's identified Environmental Manager will attend the Environmental Coordinator Training Course. This is a one-time course, with no expiration date, offered quarterly by EAD.

Conformance with the installation's Hazardous Waste Management program in accordance with the Resource Conservation Recovery Act (RCRA). The contractor's identified Environmental Manager will attend the Hazardous Waste Handlers Training Course. This is offered monthly by EAD and requires annual certification

Construction General Permit Site Inspector Training - This training shall be completed, and a certificate of training provided to the Contracting Officer, before construction begins. The certification has an expiration date. The training shall be renewed at least one week prior to the expiration date. This certification is required for all personnel that may be performing the sedimentation and erosion control inspections. The training is located at https://www.epa.gov/npdes/construction-inspection-training-course.

1.5 SPECIAL ENVIRONMENTAL REQUIREMENTS

Comply with the special environmental requirements listed here and attached at the end of this section.

1.5.1 Mid-Atlantic

Comply with the following state, regional, and local requirements.

1.5.1.1 North Carolina

1.5.1.1.1 MCAS Cherry Point

Comply with the special environmental requirements listed here and attached at the end of this section. Contractors shall abide by all requirements called out by local Air Station Orders (ASO) and governing permit requirements not specifically spelled out in these requirements. The Contractor shall review and adhere to these Orders as governing guidance while operating at MCAS Cherry Point. The 5090 series of Orders can be found on the MCAS Cherry Point Adjutant's website: https://www.cherrypoint.marines.mil/Staff/Station-Adjutant/. Additional guidance shall be provided by the Environmental Affairs Department (EAD), 252-466-3631. The Contractor shall coomply with all issued permits, including but not limited to NCG010000 https://www.deq.nc.gov/energy-mineral-and-land-resources/stormwater /npdes-general-permits/npdes-permit-ncg010000/open.

1.5.1.1.1.1 Erosion and Sedimentation Control

FOR PROJECTS OF ONE ACRE OR MORE of LAND DISTURBANCE: Install perimeter Erosion & Sedimentation Control Best Management Practices (BMPs) and sedimentation basins and diversion swales prior to denuding the entire site. EAD shall inspect prior to contractor continuing with site work. The NPDES Construction Permit NCG010000 requires erosion control devices and storm water outfalls to be inspected weekly and within 24 hours of a 1-inch rain event. It is the responsibility of the contractor to conduct these inspections and maintain records until the area has stabilized as defined in definitions section. The inspections shall note deficient BMPs and corrections taken to fix deficiencies. To facilitate rainfall monitoring, a rain gauge is required to be on site. Additionally, the contractor is responsible for conducting "self inspections" indicating the date BMPs are installed and stabilization measures (seeding/mulching or sod) are initiated. Both inspections are recorded on the same report form and must be maintained by the contractor at the onsite office. Once stabilization has been accomplished, inspection records are to be forwarded to EAD and all temporary erosion/sedimentation control devices removed with EAD's approval. The contractor is responsible for maintaining compliance with all permits and plans. A copy of the Erosion and Sedimentation (ES) Control Plan, ES Letter of Approval, NPDES Construction permit NCG010000, and NPDES Certificate of Coverage will be maintained by the contractor at the onsite office. If soil is removed from or brought onsite, the applicable Solid Waste Management permit number, Erosion Sedimentation permit number, or Mine permit number will be disclosed.

Modification to E&SC Plan : per the NCG010000, Part 2, Section G, modifications to the approved E&SC plan that require changes to the E&SC measure design, the drainage areas, or the disturbed areas draining to E&SC measures shall be approved by the E&SC plan authority. Deviations from the approved E&SC plan, or approved revised E&SC plan, shall constitute a violation of this permit unless the deviation is to correct an emergency situation where sediment is being discharged off the site. The E&SC plan authority may allow deviations from the E&SC plan on a case-by-case basis if the deviations are minor adjustments to address minor deficiencies. Minor adjustments shall be noted on the approved E&SC plan and maintained at the job site.

FOR PROJECTS OF LESS THAN ONE ACRE LAND DISTURBANCE: An E&SC plan must be developed and implemented. BMPs are required to be incorporated throughout the length of the construction process, as referenced in the NCESCDM to prevent sediment from leaving the site. Particular attention should be placed on protecting storm drains and watercourse access from sediment and debris contamination. The contractor is responsible for providing ground cover of denuded areas in accordance with Chapter 4 of Title 15A of the North Carolina Administrative Code (T15A.04) and removal of temporary E&SC control devices once stabilization as defined in the definitions section.

1.5.1.1.1.2 Monitoring Well Abandonment

Contractors must maintain the integrity of any existing or future monitoring or remediation systems at the site specifically monitoring or product recovery wells if encountered. If damaged, they must be repaired or properly abandoned and replaced by the project. Consult with EAD for further information. Well Abandonment shall be conducted in accordance with Title 15 NCAC 2C well construction standards; a certification, which reflects the abandonment procedure, must be submitted. The contractor shall provide a copy of all well installation and abandonment records to EAD.

1.5.1.1.1.3 AFFF Management

Aqueous Film Forming Foam (AFFF), or firefighting foam, and PFAS impacted materials shall be properly managed in accordance with governing policies. All spills or releases of AFFF concentrate or AFFF water shall be immediately reported in accordance with ASO 5090.7A. AFFF concentrate, if not turned over to the government, shall be disposed of by incineration only.

AFFF water shall be defined as any liquid, primarily water, mixed with AFFF concentrate or has PFAS compounds present (i.e., groundwater). This shall include rinse water used to flush lines and equipment. Triple rinsing equipment and lines does not negate the level of PFAS enough to deem the water treated even with the absence of foam.

AFFF water shall be disposed of by incineration, solidification to a permitted landfill, or treated onsite using an approved treatment system (i.e., granular activated carbon, ion exchange resin) with adequate holding capacity for the volume being treated to meet pretreatment limits prior to discharging to sanitary sewer. No discharge to sanitary sewer will be allowed without confirmatory sampling results indicating the pretreatment limits have been obtained. The contractor shall work with EAD to determine if treatment is required and to verify what the current limits are. Currently, the pretreatment limits for PFAS compounds are met when PFOS and PFOA are below 70 ppt (individually or combined). If dewatering from an Operable Unit, other contaminants will need to be considered. All PFAS samples are required to be analyzed by a DOD ELAP certified laboratory. A list of currently accredited labs can be found here: https://www.denix.osd.mil/edqw/accreditation/accreditedlabs/. Test Method 1633 shall be used for all non-potable water matrices.

Disposal of AFFF concentrate and AFFF water off-station shall be manifested on an original, serialized EPA Uniform Hazardous Waste Manifest form 8700-22 (Rev. 3-05). AFFF currently used on MCAS Cherry Point contains PFAS compounds that are not currently regulated as a hazardous waste, therefore it shall be marked on the manifest as "Non-Hazardous,

Non-Regulated Waste" with PFAS entered as a waste code. All manifests shall be signed by designated EAD personnel. Contractors shall not sign the disposal documents for AFFF waste generated while working aboard MCAS Cherry Point on behalf of the government.

1.5.1.1.1.4 SWMU Management

Solid Waste Management Unit (SWMU) (C-15) oil/water separators (OWS) as well as Industrial Wastewater Treatment Plant (IWTP) lines (C-13), are both regulated by the State of North Carolina Division of Waste Management, Hazardous Waste Management Permit issued to MCAS Cherry Point. Physical alterations at SWMUs must be planned and coordinated with EAD. This team works closely with NCDEQ to maintain compliance with the MCAS Cherry Point Hazardous Waste Management Permit regarding investigation and cleanups at SWMUs. The improper removal of an oil/water separator, grease rack or wash rack, or IWTP line constitutes multiple violations of the MCAS Cherry Point RCRA permit. No construction project can move forward without the proper closure of the SWMU. Applicable regulations are those which are in effect on the date of issuance of the Cherry Point State of North Carolina Division of Waste Management Hazardous Waste Management Permit 40 CFR 207.32(c)as adopted in 15A NCAC 13A.0113.

1.5.1.1.1.5 Contaminated Soil Management

Collections, Segregation and Testing of Contaminated Soils: The contaminated soil will be stock piled on a plastic protected berm and covered from the weather. Once the work is completed or a proper amount is collected for disposal shipment, then the contractor will select a laboratory to conduct the soil analytical testing. The tests to be conducted are Gasoline Range Organics (GRO), Diesel Range Organics (DRO), Oil & Grease with a silica gel wash, and Full TCLP. The soil samples shall be pulled by certified personnel trained in soil sampling methodology. The laboratory must be a NC laboratory certified in the test being conducted. A copy of the soil analytical testing results shall be sent to EAD for review. If contamination is discovered, the stockpile sample(s) shall be analyzed for the following but not limited to:

Std Method 5030 sample prep with Modified 8015 (CA GC-FID Method) - Total Petroleum Hydrocarbons (TPH) - Gasoline Range Organics,

Std Method 5030 and 3550 sample prep with Modified 8015 - Total Petroleum Hydrocarbons (TPH) - Diesel Range Organics,

EPA Method 9071 - Oil & Grease with Silica Gel wash

Full TCLP

EPA Method 1633 for PFAS

Disposal Facility: The disposal facility type will be determined based on the analytical results. EAD will advise what type of facility is proper for the soil disposal. At this point the contractor will chose a facility for disposal. The contractor will share the soil analytical data with the chosen disposal facility to determine if the soil meets the facility permit requirements. If so, then the disposal facility will send a letter to EAD stating that the facility can receive the subject soil for disposal based on the facility's permit requirements. A copy of the facility's permit will need to be sent along with the acceptance letter for EAD

review & records. If the permit information is current then the facility will be approved for use.

Preparing for Transportation of soil for Disposal: The disposal facility will provide EAD with a waste profile form that EAD will review and sign if the information clearly defines the soil disposition based on the analytical data. The signed Waste profile will be returned to the disposal facility for their records. The disposal facility may or should provide waste manifests with the appropriate information about the generator and the type of waste being transported for disposal. Below is an example of the information found on a waste manifest. Remember that if the analytical results only indicate POL contamination, the soil is not "Hazardous Waste". The soil is called Non-Hazardous Waste for shipping purposes.

Day of Transport to the Disposal Facility: The waste manifest should be on site at a minimum one to two days before shipping. The number of manifest needs to be in excess so to have plenty for all possible loads being shipped. The trucks will weigh trucks in for an "Empty weight" at the start of the day and weigh each load before leaving MCAS Cherry Point. EAD will sign the manifest for the transporter and disposal facility.

Any questions, please contact Environmental Affairs Department MCAS Cherry Point, 252-466-3631.

1.6 QUALITY ASSURANCE

1.6.1 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.

1.6.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state, and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 15 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.6.3 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) or equipment local requirement. 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.

1.6.4 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager is directly responsible for coordinating contractor compliance with federal, state, local, and installation requirements such as ASO 5090.13A, ASO 5090.14, ASO 5090.3B, ASO 5090.5B, ASO 5090.7A, and MCASCPICP. 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 40 CFR 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.

1.6.5 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR 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 federal, state and local regulatory requirements for RCRA Large Quantity Generator. Provide a Position Description for each employee, by subcontractor, based on the Davis-Bacon Wage Rate designation or other equivalent method, evaluating the employee's association with hazardous and regulated wastes. This Position Description will include training requirements as defined in 40 CFR 265 for a Large Quantity Generator facility. Submit these Assembled Employee Training Records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet EPA and state 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 the United States, and endangered species and their habitat that are known to be in the area.

1.6.6 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state, or local environmental laws or regulations, permits, 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. FAR 52.242-14 Suspension of Work provides that a suspension, delay, or interruption of work due to the fault or negligence of the Contractor allows for no adjustments to the contract for time extensions or equitable adjustments. In addition to a suspension of work, the Contracting Officer may use additional authorities under the contract or law.

1.7 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. The EPP shall have a section incorporating the Stormwater Pollution Protection Plan, E&SC Plan, and NCG01. 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 and not less than 10 days before the preconstruction meeting. 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 applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.7.1 General Overview and Purpose

1.7.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as spill control plan, solid waste management plan, air pollution control plan, contaminant prevention plan, traffic control plan, Hazardous, Toxic and Radioactive Waste (HTRW) Plan,

Non-Hazardous Solid Waste Disposal Plan.

1.7.1.2 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.

1.7.1.3 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.

1.7.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.7.1.5 Contact Information

Emergency contact information (office phone number, cell phone number, and e-mail address).

1.7.2 General Site Information

1.7.2.1 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.

1.7.2.2 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.

Show where any fuels, hazardous substances, solvents, or lubricants will be stored. Provide a spill plan to address any releases of those materials.

1.7.2.3 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.

1.7.3 Management of Natural Resources

a. Land resources
b. Tree protection
c. Replacement of damaged landscape features
d. Temporary construction
e. Stream crossings
f. Fish and wildlife resources
g. Wetland areas

1.7.4 Protection of Historical and Archaeological Resources

a. Objectives
b. Methods

1.7.5 Stormwater Management and Control

a. Ground cover
b. Erodible soils
c. Temporary measures
   (1) Structural Practices
   (2) Temporary and permanent stabilization
d. Effective selection, implementation, and maintenance of Best Management Practices (BMPs).
e. Stormwater Pollution Prevention Plan (SWPPP).

1.7.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste.

Control and disposal of hazardous waste.

This item consists of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan when within an installation. The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan as applicable.

As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268

)

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures

i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.7.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.7.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.7.9 Clean Air Act Compliance

1.7.9.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan 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.

1.7.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits 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). Ensure required permits are obtained prior to installing and operating applicable equipment/processes.

1.7.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used, or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. 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 maintenance/testing, emergency, and non-emergency operation.

1.7.9.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with 40 CFR 82 requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment, and log work that requires the addition or removal of refrigerant. Any refrigerant reclaimed is the property of the Government. Coordinate with the Installation Environmental Office to determine the appropriate turn in location.

1.7.9.5 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.

1.7.9.6 Compliant Materials

Provide the Government a list of SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations 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.

1.8 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7 Permits and Responsibilities. Notify the Government of all equipment that may require permits or special approvals that the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7 Permits and Responsibilities.

1.9 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.10 SOLID WASTE MANAGEMENT PERMIT

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 license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.10.1 Monthly Solid Waste Disposal Report

Monthly, submit a solid waste disposal report to the Contracting Officer.

For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

1.11 FACILITY HAZARDOUS WASTE GENERATOR STATUS

MCAS Cherry Point is designated as a Large Quantity Generator. Meet the regulatory requirements of this generator designation for any work conducted within the boundaries of this Installation. Comply with provisions of federal, state, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of construction derived wastes.

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 as applicable, 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.

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 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the federal, state, and local governments. Construction of stream crossing structures must be in compliance with all required permits including, but not limited to, Clean Water Act Section 404, and Section 401 Water Quality.

The Contracting Officer's approval and appropriate 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.

3.2 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.

3.2.1 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. 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 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, all markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.3 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.

3.2.4 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements. Comply with local requirements.

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 state water quality standards and designated uses of the surface water body. Comply with the State of North Carolina 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 or Contracting Officer. 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 and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States, except as authorized herein. The protection of waters of the United States shown on the drawings in accordance with paragraph LICENSES AND PERMITS is the Contractor's responsibility. Authorization to enter specific waters of the United States identified does not relieve the Contractor from any obligation to protect other waters of the United States within, adjacent to, or in the vicinity of the construction site and associated boundaries.

3.4 PROTECTION OF CULTURAL RESOURCES

3.4.1 Archaeological Resources

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 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

40 CFR 64 and state air emission and performance laws and standards.

3.5.1 Preconstruction Air Permits

Notify the Air Program Manager, through the Contracting Officer, at least 6 months prior to bringing equipment, assembled or unassembled, onto the Installation, so that air permits can be secured. Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the Installation.

3.5.2 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). Provide in accordance with paragraph PRECONSTRUCTION AIR PERMITS.

3.5.3 Burning

Burning is prohibited on the Government premises.

3.5.4 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 appropriate location for turn in of all reclaimed refrigerant.

3.5.5 Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer and to EAD. Intentional venting of refrigerants (including most Non-ODS substitute refrigerants) is prohibited per 40 CFR 82.

3.5.6 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.5.7 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. Since these products contain Crystalline Silica, comply with the applicable OSHA standard, 29 CFR 1910.1053 or 29 CFR 1926.1153 for controlling exposure to

Crystalline Silica Dust.

3.5.7.1 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 40 CFR 50, state, and local 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 will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. 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 state and local visibility regulations.

3.5.7.2 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 29 CFR 1910.

3.5.8 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.6 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.

3.6.1 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.

3.6.2 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 Contracting Officer and to EAD 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 yards or tons, as appropriate
C&D Debris Recycled	(_____) cubic yards or tons, as appropriate
C&D Debris Composted	(_____) cubic yards or tons, as appropriate
Total C&D Debris Generated	(_____) cubic yards or tons, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	(_____) cubic yards or tons, as appropriate

3.7 WASTE MANAGEMENT AND DISPOSAL

3.7.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. 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 40 CFR 262.11 or corresponding applicable state or local regulations. 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 exhaustive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.7.2 Solid Waste Management

3.7.2.1 Project Solid Waste Disposal Documentation Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. 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, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the

Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.7.2.2 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 40 CFR 260, state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Segregate and separate treated wood components disposed at a lined landfill approved to accept this waste in accordance with local and state regulations. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

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 49 CFR 173.

3.7.3 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 and Installation Hazardous Waste Manager. The Contractor shall adhere to all requirements set forth in ASO 5090.5B.

3.7.3.1 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 federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. 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 40 CFR 372-SUBPART D.

3.7.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or one quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90-day or 180-day, as appropriate, accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	(_____)
Contractor	(_____)
Haz/Waste or Regulated Waste POC	(_____)
Phone Number	(_____)
Type of Waste	(_____)
Source of Waste	(_____)
Emergency POC	(_____)
Phone Number	(_____)
Location of the Site	(_____)

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g., training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.7.3.3 Hazardous Waste Disposal

3.7.3.3.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off Government property.

3.7.3.3.1.1 Services

Provide service necessary for the final treatment or disposal of the hazardous material or waste in accordance with 40 CFR 260 - 40 CFR 279, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated. These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.7.3.3.1.2 Samples

Obtain a representative sample of the material generated for each job done to provide waste stream determination.

3.7.3.3.1.3 Analysis

Analyze each sample taken and provide analytical results to the Contracting Officer. See paragraph WASTE DETERMINATION DOCUMENTATION.

3.7.3.3.1.4 Labeling

During waste accumulation label all containers in accordance with 40 CFR 262. Prior to offering a waste for off-site transport, determine the Department of Transportation's (DOT's) proper shipping names for waste in accordance with 49 CFR 172 (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262 and applicable state or local regulations.

3.7.3.4 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

a. Batteries as described in 40 CFR 273.2

b. Lamps as described in 40 CFR 273.5

c. Mercury-containing equipment as described in 40 CFR 273.4

d. Aerosol cans as described in 40 CFR 273.6

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.7.3.5 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 40 CFR 260-262, state, and local requirements, and installation instructions.

3.7.3.6 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer and EAD for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or state permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. 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. Refer to location special requirements for the Installation Point of Contact information.

3.7.4 Releases/Spills of Oil and Hazardous Substances

3.7.4.1 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 40 CFR 300. 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 Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Contracting Officer, and the state or local authority.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, and local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government. The Contractor shall adhere to all requirements set forth in ASO 5090.7A.

3.7.4.2 Clean Up

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.

3.7.5 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.

3.7.6 Wastewater

3.7.6.1 Disposal of Wastewater

Disposal of wastewater must be as specified below.

3.7.6.1.1 Handling of Concrete Contaminated Water

Do not allow concrete contaminated water from construction activities,

such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related water off-Government property in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.7.6.1.2 Surface Discharge

For discharge of ground water, Surface discharge in accordance with federal, state, and local laws and regulations.

3.7.6.1.3 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 federal, state, and local laws and regulations for land application.

3.8 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 an SDS 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. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261, state, and installation requirements.

3.8.1 Contractor Hazardous Material Inventory Log

Submit the "Contractor Hazardous Material Inventory Log"(found at: https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs /forms-graphics-tables), which provides information required by (EPCRA Sections 312 and 313) along with corresponding SDS, to the Contracting Officer at the start and at the end of construction (30 days from final acceptance), and update no later than January 31 of each calendar year during the life of the contract. Keep copies of the SDSs for hazardous materials onsite. At the end of the project, provide the Contracting Officer with copies of the SDSs, and the maximum quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used.

The Contracting Officer may request documentation for any spills or releases, environmental reports, or off-site transfers.

3.9 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. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.10 CONTROL AND MANAGEMENT OF ASBESTOS-CONTAINING MATERIAL (ACM)

Manage and dispose of asbestos-containing waste in accordance with all applicable federal, state, and local requirements. Refer to Section 02 82 00 ASBESTOS REMEDIATION. Manifest asbestos-containing waste and provide the manifest to the Contracting Officer. Notifications to the regulatory authorities and Installation Air Program Manager are required before starting any asbestos work.

3.11 CONTROL AND MANAGEMENT OF LEAD-BASED PAINT (LBP)

Manage and dispose of lead-contaminated waste in accordance with 40 CFR 745 and Section 02 83 00 LEAD REMEDIATION. Manifest any lead-contaminated waste and provide the manifest to the Contracting Officer.

3.12 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 EPA 40 CFR 112, ASO 5090.7A, and other federal, state, regional, and local laws and regulations. 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 the United States. 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.

3.12.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. 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 shall be 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.

3.12.2 Oil Storage Including Fuel Tanks

The Contractor shall adhere to all requirements set forth in ASO 5090.7A. The Contractor shall 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 5 inches 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 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a Spill Prevention Control and Countermeasure (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 and EAD 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.

3.13 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.

3.14 CHLORDANE

Evaluate excess soils and concrete foundation debris generated during the demolition of housing units or other wooden structures for the presence of chlordane or other pesticides prior to reuse or final disposal.

3.15 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives are not permitted.

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the State of North Carolina rules.

3.16 AS-BUILT CERTIFICATIONS FOR PERMITTING CLOSEOUT

Submit As-Built Certifications for Permitting Closeout, including, but not limited to, stormwater control measures, sewage extensions, and drinking water connections.

3.17 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 parking area and similar temporarily used areas to conform with surrounding contours.

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SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
02/19, CHG 3: 11/21

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.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 273	Standards for Universal Waste Management
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Co-mingle

The practice of placing unrelated materials together in a single container, usually for benefits of convenience and speed.

1.2.2 Construction Waste

Waste generated by construction activities, such as scrap materials, damaged or spoiled materials, temporary and expendable construction materials, and other waste generated by the workforce during construction activities.

1.2.3 Demolition Debris/Waste

Waste generated from demolition activities, including minor incidental demolition waste materials generated as a result of Intentional dismantling of all or portions of a building, to include clearing of building contents that have been destroyed or damaged.

1.2.4 Disposal

Depositing waste in a solid waste disposal facility, usually a managed landfill or incinerator, regulated in the US under the Resource Conservation and Recovery Act (RCRA).

1.2.5 Diversion

The practice of diverting waste from disposal in a landfill or incinerator, by means of eliminating or minimizing waste, or reuse of materials.

1.2.6 Final Construction Waste Diversion Report

A written assertion by a material recovery facility operator identifying

constituent materials diverted from disposal, usually including summary tabulations of materials, weight in short-ton.

1.2.7 Recycling

The series of activities, including collection, separation, and processing, by which products or other materials are diverted from the solid waste stream for use in the form of raw materials in the manufacture of new products sold or distributed in commerce, or the reuse of such materials as substitutes for goods made of virgin materials, other than fuel.

1.2.8 Reuse

The use of a product or materials again for the same purpose, in its original form or with little enhancement or change.

1.2.9 Salvage

Usable, salable items derived from buildings undergoing demolition or deconstruction, parts from vehicles, machinery, other equipment, or other components.

1.2.10 Source Separation

The practice of administering and implementing a management strategy to identify and segregate unrelated waste at the first opportunity.

1.3 CONSTRUCTION WASTE (INCLUDES DEMOLITION DEBRIS/WASTE)

Divert a minimum of 60 percent by weight of the project construction waste and demolition debris/waste from the landfill or incinerator. Follow applicable industry standards in the management of waste. Apply sound environmental principles in the management of waste. (1) Practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction waste and demolition debris/waste from landfills and incinerators and to facilitate the recycling or reuse of excess construction materials.

1.4 CONSTRUCTION WASTE MANAGEMENT

Implement a Construction Waste Management Program for the project. Take a pro-active, responsible role in the management of construction waste, recycling process, disposal of demolition debris/waste, and require all subcontractors, vendors, and suppliers to participate in the Construction Waste Management Program. Establish a process for clear tracking and documentation of construction waste and demolition debris/waste.

1.4.1 Implementation of Construction Waste Management Program

Develop and document how the Construction Waste Management Program will be implemented in a Construction Waste Management Plan. Submit a Construction Waste Management Plan to the Contracting Officer for approval. Construction waste and demolition debris/waste materials include un-used construction materials not incorporated in the final work, as well as demolition debris/waste materials from demolition activities or deconstruction activities. In the management of waste, consider the availability of viable markets, the condition of materials, the ability to provide material in suitable condition and in a quantity acceptable to

available markets, and time constraints imposed by internal project completion mandates.

1.4.2 Oversight

The Environmental Manager, as specified in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS, is responsible for overseeing and documenting results from executing the Construction Waste Management Plan for the project.

1.4.3 Special Programs

Implement special programs involving rebates or similar incentives related to recycling of construction waste and demolition debris/waste materials. Retain revenue or savings from salvaged or recycling, unless otherwise directed. Ensure firms and facilities used for recycling, reuse, and disposal are permitted for the intended use to the extent required by federal, state, and local regulations.

1.4.4 Special Instructions

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 projects. Designation of single source separating or commingling will be clearly marked on the containers.

1.4.5 Waste Streams

Delineate waste streams and characterization, including estimated material types and quantities of waste, in the Construction Waste Management Plan. Manage all waste streams associated with the project. Typical waste streams are listed below. Include additional waste steams not listed:

a. Land Clearing Debris

b. Asphalt

c. Masonry and CMU

d. Concrete

e. Metals (Includes, but is not limited to, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, bronze.)

f. Wood (nails and staples allowed)

g. Glass

h. Paper

i. Plastics (PET, HDPE,PVC,LDPE,PP,PS, Other)

j. Gypsum

k. Non-hazardous paint and paint cans

l. Carpet

m. Ceiling Tiles

n. Insulation

o. Beverage Containers

1.5 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Waste Management Plan

SD-11 Closeout Submittals

Final Construction Waste Diversion Report; S

1.6 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 Construction Waste Management Plan and to develop a mutual understanding relative to the management of the Construction Waste Management Program and how waste diversion requirements will be met.

The requirements of this meeting may be fulfilled during the coordination and mutual understanding meeting outlined in Section 01 45 00 QUALITY CONTROL. At a minimum, discuss and document waste management goals at the following meetings:

a. Preconstruction and Pre-demolition meeting.

b. Regular siteQuality Control meetings.

c. Work safety meeting (if applicable).

1.7 CONSTRUCTION WASTE MANAGEMENT PLAN

Submit Construction Waste Management Plan within 45 calendar days after contract award. Revise and resubmit Construction Waste Management Plan as necessary, in order for construction to begin.. Execute demolition or deconstruction activities in accordance with Section 02 41 00 BUILDING DECONSTRUCTION. Manage demolition debris/waste or deconstruction materials in accordance with the approved construction waste management plan.

An approved Construction Waste Management Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Ensure all subcontractors receive a copy of the approved Construction Waste Management Plan. The plan demonstrates how to meet the project waste diversion requirement. Also, include the following in the plan:

a. Identify the names of individuals responsible for waste management and waste management tracking, along with roles and responsibilities on the project.

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 materials.

e. Name of landfill and incinerator to be used.

f. Identification of local and regional re-use programs, including non-profit organizations such as schools, local housing agencies, and organization that accept used materials such as material exchange networks and resale stores. Include the name, location, and phone number for each re-use facility identified, and provide a copy of the permit or license for each facility.

g. List of specific materials, by type and quantity, 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, address, and phone number.

h. Identification of materials that cannot be recycled or reused with an explanation or justification, to be approved by the Contracting Officer.

i. Description of the means by which materials identified in item (g) above will be protected from contamination.

j. 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).

k. Copy of training plan for subcontractors and other services to prevent contamination by co-mingling materials identified for diversion and waste materials.

l. Identification of at least 5 construction or demolition material streams for diversion.

m. Facilities or subcontractors offering construction waste transport on-site or off-site must ensure that proper shipping orders, bill of lading, manifests, or other shipping documents containing waste diversion information meet requirements of 40 CFR 273 Universal Waste Management, 49 CFR 173 Shippers - General Requirements for Shipments and Packagings, and 49 CFR 178 Specifications for Packaging. Individuals signing manifests or other shipping documents should meet the minimum training requirements.

n. List each supplier who delivers construction materials, in bulk, or package products in returnable containers or returnable packaging, or have take-back programs. List each program and the applicable material to actively monitor and track to assist in meeting waste diversion requirements on the project.

Distribute copies of the waste management plan to each subcontractor, Environmental Manager, and the Contracting Officer.

1.8 RECORDS (DOCUMENTATION)

1.8.1 General

Maintain records to document the types and quantities of waste generated and diverted though re-use, recycling, and sale to third parties; through disposal to a landfill or incinerator facility. Provide explanations for materials not recycled, reused, or sold. Collect and retain manifests, weight tickets, sales receipts, and invoices specifically identifying diverted project waste materials or disposed materials.

1.8.2 Accumulated

Maintain a running record of materials generated and diverted from landfill disposal, including accumulated diversion rates for the project. Make records available to the Contracting Officer during construction or incidental demolition activities. Provide a copy of the diversion records to the Contracting Officer upon completion of the construction, incidental demolitions, or minor deconstruction activities.

1.9 FINAL CONSTRUCTION WASTE DIVERSION REPORT

A Final Construction Waste Diversion Report is required at the end of the project. Provide Final Construction Waste Diversion Report 60 days prior to the Beneficial Occupancy Date (BOD). The final Construction Waste Diversion Report must be included in the Sustainability eNotebook in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

1.10 COLLECTION

Collect, store, protect, and handle reusable and recyclable materials at the site in a manner which prevents contamination and provides protection from the elements to preserve their usefulness and monetary value. Provide receptacles and storage areas designated specifically for recyclable and reusable materials and label them clearly and appropriately to prevent contamination from other waste materials. Keep receptacles or storage areas neat and clean.

Train subcontractors and other service providers to either separate waste streams or use the co-mingling method as described in the Construction Waste Management Plan. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. Separate materials by one of the following methods described herein:

1.10.1 Source Separation Method

Separate waste products and materials that are recyclable from trash and sort as described below into appropriately marked separate containers and then transport 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 category types as defined in the Construction Waste Management Plan.

1.10.2 Other Methods

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.11 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures as described in the waste management plan. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

1.11.1 Reuse

Give first consideration to reusing construction and demolition materials as a disposition strategy. Recover for reuse materials, products, and components as described in the approved Construction Waste Management Plan. Coordinate with the Contracting Officer to identify onsite reuse opportunities or material sales or donation available through Government resale or donation programs. Sale of recovered materials is not allowed on the Installation. Consider the use of surplus industrial supply broker services, who match entities with reusable or repurpose industrial materials with entities with need of such materials.

1.11.2 Recycle

Recycle non-hazardous construction and demolition/debris materials that are not suitable for reuse. Track rejection of contaminated recyclable materials by the recycling facility. Rejected recyclable materials will not be counted as a percentage of diversion calculation. Recycle all fluorescent lamps, HID lamps, mercury (Hg) -containing thermostats and ampoules, and PCBs-containing ballasts and electrical components as directed by the Contracting Officer. Do not crush lamps on site as this creates a hazardous waste stream with additional handling requirements.

1.11.3 Waste

Dispose by landfill or incineration only those waste materials with no practical use, economic benefit, or recycling opportunity.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used. -- End of Section --

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SECTION 01 78 00

CLOSEOUT SUBMITTALS
05/19, 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.

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37	(2017) Cleaning Products for Industrial and Institutional Use

U.S. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N	(2024) Navy and Marine Corps Design
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. These files serve as the basis for the creation of the record drawings.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan
Warranty Tags
Final Cleaning
Spare Parts Data

SD-08 Manufacturer's Instructions

Posted Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals

SD-11 Closeout Submittals

As-Built Drawings
As-Built Record of Equipment and Materials
Certification of EPA Designated Items
Certification Of USDA Designated Items
Interim DD FORM 1354
Checklist for DD FORM 1354

1.4 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

a. Indicate manufacturer's name, part number, and stock level required for test and balance, pre-commissioning, maintenance and repair activities. List those items that may be standard to the normal maintenance of the system.

1.5 WARRANTY MANAGEMENT

1.5.1 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 e-mail 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) Names, addresses and telephone numbers of sources of spare parts.
(6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have warranties longer than one year must be indicated with separate warranty expiration dates.
(7) Cross-reference to warranty certificates as applicable.
(8) Starting point and duration of warranty period.
(9) Summary of maintenance procedures required to continue the warranty in force.
(10) Cross-reference to specific pertinent Operation and Maintenance manuals.
(11) Organization, names and phone numbers of persons to call for warranty service.
(12) 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 warranties longer than one year.

g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty or safety reasons.

1.5.2 Performance Bond

The Performance Bond must remain effective throughout the construction and warranty 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.

1.5.3 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 QC 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.

1.5.4 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 CERTIFICATION OF EPA DESIGNATED ITEMS

Submit the Certification of EPA Designated Items as required by FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items and FAR 52-223-17 Affirmative Procurement of EPA designated items in Service and Construction Contracts. Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:

a. The product does not meet appropriate performance standards;
b. The product is not available within a reasonable time frame;
c. The product is not available competitively (from two or more sources);
d. The product is only available at an unreasonable price (compared with a comparable non-recycled content product)."

Record each product used in the project that has a requirement or option of containing recycled content in accordance with SECTION 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, exemptions (a, b, c, or d, as indicated), and comments. Recycled content values may be determined by weight or volume percent, but must be consistent throughout.

2.2 CERTIFICATION OF USDA DESIGNATED ITEMS

Submit the Certification of USDA Designated Items as required by FAR 52-223-1 Bio-based Product Certifications and FAR 52.223-2 Affirmative Procurement of Biobased Products Under Service and Construction Contracts. Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current USDA standards for biobased materials content. The following exemptions may apply to the non-procurement of biobased content materials:

a. The product does not meet appropriate performance standards;
b. The product is not available within a reasonable time frame;
c. The product is not available competitively (from two or more sources);
d. The product is only available at an unreasonable price (compared with a comparable bio-based content product)."

Record each product used in the project that has a requirement or option of containing biobased content in accordance with SECTION 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, total value of biobased content, exemptions (a, b, c, or d, as indicated), and comments. Biobased content values may be determined by weight or volume percent, but must be consistent throughout.

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 Occupancy 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

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.

l. Modifications and compliance with FC 1-300-09N procedures.

m. Actual location of anchors, construction and control joints, etc., in concrete.

n. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

o. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.2 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA. Provide four electronic copies of the Operation and Maintenance Manual files. Submit to the Contracting Officer for approval within 60 calendar days of the Beneficial Occupancy Date (BOD). Update and resubmit files for final approval at BOD.

3.3 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. Replace filters of operating equipment and comply with the Indoor Air Quality (IAQ) Management Plan. 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 TEMPORARY ENVIRONMENTAL CONTROLS.

3.4 REAL PROPERTY RECORD

Refer to UFC 1-300-08 for instruction on completing the DD FORM 1354. Contact the Contracting Officer for any project specific information necessary to complete the DD FORM 1354.

3.4.1 Interim DD FORM 1354

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft DD FORM 1354 attached to this section, and submit an accounting of all installed property with Interim DD FORM 1354. Include any additional assets, improvements, and alterations from the Draft DD FORM 1354.

3.4.2 Completed DD FORM 1354

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 --

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SECTION 01 78 23

OPERATION AND MAINTENANCE DATA
05/23

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 GUIDELINE 1.4	(2019) Preparing Systems Manuals for Facilities

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings
ASTM E2166	(2016) Standard Practice for Organizing and Managing Building Data

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

Facility Data Workbook
Training Plan
Training Outline
Training Content
Operation And Maintenance Manual, Progress Submittal
Operation And Maintenance Manual, Prefinal Submittal
Operation And Maintenance Manual, Final Submittal

SD-11 Closeout Submittals

Training Video Recording
Validation of Training Completion
Training Plan

1.3 MEETINGS

To assure that Operation and Maintenance (O&M) Manual and Facility Data Workbook (FDW) requirements are being met through the duration of the project, organize the following meetings and discuss the subsequent topics:

1.3.1 Pre-Construction Meeting

At a minimum, discuss the following:

a. The requirement for O&M Manuals and Facility Data deliverables under this contract including coordination meetings

b. Processes and method of gathering Facility Data information during construction

c. Primary roles and responsibilities associated with the development and delivery of the O&M Manuals and Facility Data deliverables, and

d. Identify and agree upon a date and attendance list for the meetings described below:

1.3.2 O&M Manual and FDW Coordination Meeting

Facilitate a meeting after the Pre-Construction Meeting prior to the submission of the O&M Manual Progress Submittal. Meeting attendance must include the Contractor's O&M Manual and FDW Preparer, Quality Control (QC) Manager, the Commissioning Authority (CxA), the Government's Design Manager (DM), Contracting Officer's Representative, and Government's facility data reviewer. Include any Mechanical, Electrical, and Fire Protection Sub-Contractors.

The purpose of this meeting is to reach a mutual understanding of the scope of work concerning the contract requirements for O&M Manual and coordinate the efforts necessary by both the Government and Contractor to ensure an accurate collection, preparation, and timely Government review of O&M Manual.

1.3.3 Submittal Coordination Meeting

Facilitate a meeting following submission and Government review of each design or progress submittal of the O&M Manuals and FDW.

a. Include personnel from the Coordination meeting and any additional personnel identified.

b. The purpose of this meeting is to demonstrate ongoing compliance with the requirements identified in this specification. Discuss Government review comments and unresolved items preventing completion and Government approval of the O&M Manuals and FDW.

c. The applicable deliverables, along with Government remarks associated with review of these submittals serve as the primary guide and agenda for this meeting.

1.3.4 Facility Turnover Meeting

Include O&M Manual in NAVFAC Red Zone (NRZ) facility turnover meetings as specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

1.4 FACILITY DATA WORKBOOK

Develop an editable, electronic spreadsheet based on the equipment in the O&M Manuals that contains the information required to start a preventive maintenance program. As a minimum, provide FDW as a list of system equipment, location installed, warranty expiration date, manufacturer, model, and serial number.

1.5 OPERATION AND MAINTENANCE MANUAL MEDIA

Assemble O&M Manual into an electronically bookmarked 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 bookmarked O&M directory.

1.5.1 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

1.5.2 O&M Manual Tabbed Hard Copy

Provide a hard copy of the O&M manual upon completion of the project. Provide tabs for each section and subsection for ease of navigation by the user.

1.6 O&M MANUAL CONTENT

Organize thebookmarked O&M Manual into the following Parts in accordance with ASHRAE GUIDELINE 1.4, and as modified and detailed below. Word template for O&M Manual is available at: https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-01-78-23.

1.6.1 Part 1: Executive Summary

Provide a summary of the information found in the O&M manual including the purpose of the manual and a description of the manual's organization.

1.6.2 Part 2: Facility Design and Construction

1.6.2.1 General Facility and Systems Description

Provide an overview of the intent for design and use of the facility. Provide a PDF of the Record Drawings prepared in accordance with 01 78 00 CLOSEOUT SUBMITTALS and bookmarked using the sheet title and sheet number. Include uncluttered 11 by 17 inches floor plans with room numbers, type or function of space, and overall facility dimensions on the floor plans. Do not include items such as construction instructions, references, or frame numbers.

Detail the overall dimensions of the facility, number of floors, foundation type, expected number of occupants, and facility Category Code list and generally describe all the facility systems and any special building features (for example, HVAC Controls, Sprinkler Systems, Cranes,

Elevators, and Generators). Include photographs marked up and labeled to show key operating components and the overall facility appearance.

1.6.2.2 Basis of Design

Provide a copy of the contract Basis of Design.

1.6.2.3 Contract Documents, RFP, Amendments, and Modifications

Provide the contract construction documents complete, to include specifications, drawings, Request for Proposal, amendments, and modifications.

1.6.2.4 Room Inventory of Real Property and Finishes

Provide a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include, as applicable, the following information for each piece of equipment installed: description of item, all dimensions, 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. Real property includes, but is not limited to, floor coverings, wall surfaces, ceiling surfaces, windows, roofing, HVAC filters, plumbing fixtures, and lighting fixtures. Submit the final list 30 days after transfer of the completed facility.

Include spatial data defining actual net square footage and data of each room. Also include the room finish schedule including room names and numbers. Include schedules in the construction drawings in the room inventory. Add a column to each schedule to record what was provided by the contractor during construction. Provide a PDF of room inventory. 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
(_____)				

1.6.3 Part 3: Facilities, Systems, and Assemblies Information

1.6.3.1 Organization

Bookmark information in this section using the current version of ASTM E2166 Uniformat II, UFGS numbers, and document type as outlined in the example below. Bookmark/tab each item to the third level for easy navigation of the manual.

Example as shown in Table below:

PARTS AND SUBPART NUMBERING
3.1 B20 EXTERIOR CLOSURE (System)
3.1.1 B2030 EXTERIOR DOORS (Subsystem)
3.1.1.1 B2030110 GLAZED DOORS (Component)
3.1.1.1.1 Applicable specifications List in UFGS Format
3.1.1.1.2 Manufacturer's Operations and Maintenance Data
3.1.1.1.3 Approved Submittal
3.1.1.1.4 Coordination/Shop Drawings
3.1.1.1.5 Sequence of Operation for Operating Equipment
3.1.1.1.6 Testing Equipment Information and Performance Data
3.1.1.1.7 Routine Maintenance Requirements
3.1.1.1.8 Repair Procedures
3.1.1.1.9 Emergency Procedures & Locations of Applicable Controls
3.1.1.1.10 Warranties
3.1.1.1.11 Record Drawings and Utility Systems
3.1.1.1.12 Contractor / Supplies Listing and Contact Information

1.6.3.2 Related Specifications

Reference each specification related to the subsystem in this section, and locate the actual specification section in Part 2 of the O&M Manual. List specifications in table format as shown in the below example.

UFGS Number	Specification Title	Page Spec Begins in Part 2

1.6.3.3 Manufacturer's Operations and Maintenance Data

Provide a copy of all manufacturer specifications and cutsheets. Provide text-searchable, high-quality document files from the manufacturer's online or electronic documentation. Color documents are preferred. Provide documents specific to the product(s) installed under this Contract. Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Provide Uniformat II Level 3 identification for D20, D30, D40 installed equipment. When possible, do not submit document files containing multiple product catalogs from the same manufacturer, or product data from multiple manufacturers in the same files. Provide documents directly from the manufacturer whenever possible. Do not

provide scanned copies of hardcopy documents. 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 will 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 part catalog.

1.6.3.4 Approved Submittals and Certificates

Provide a copy of all submittals documented with the required approval as applicable for each UFGS specification listed in the table outlined in applicable specifications. Include copies of SD-07 Certificates submittals documented with the required approval, SD-08 Manufacturer's Instructions submittals documented with the required approval, and SD-10 Operation and Maintenance Data submittals documents with the required approval.

1.6.3.5 Approved Coordination/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.

1.6.4 Sequence of Operation for Operating Equipment

Provide record one-line diagrams for each floor, delineating mechanical equipment location within the building. Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.6.4.1 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 GOVERNMENTAL SAFETY REQUIREMENTS. Provide recommended safeguards for each identified hazard. Specify if any certifications or licenses are required to operate the equipment.

1.6.4.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.6.4.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.6.4.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.6.4.5 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.

1.6.4.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.6.4.7 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.

1.6.4.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.6.4.9 Additional Requirements for Equipment Control Systems

Provide Data Package 5 and the following for all control systems:

a. Provide 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. Submit complete controls equipment schedules, full as-built sequence of operations, wiring and logic diagrams, Input/Output Tables, equipment schedules, copies of checkout tests and calibrations performed by the Contractor (not Cx tests), and all associated information.

c. 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

d. Full print out of all schedules and set points after testing and acceptance of the system.

e. Full as-built print out of software program.

f. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.6.4.10 Testing Equipment Information and Performance Data

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.

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 Routine Maintenance Requirements

1.6.5.1 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 should be retested. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including requirements by type of activity. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

a. Define the anticipated time required to perform 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.

1.6.5.2 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. Provide procedural instructions for Oil Sampling for all equipment.

c. A Lubrication Schedule showing service interval frequency.

1.6.6 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards. 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. Specify if any certifications or licenses are required to repair the equipment.

1.6.6.1 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.

1.6.6.2 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.

1.6.6.3 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required specialty 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.

1.6.6.4 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.

1.6.6.5 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. Identify if replacement of a subassembly, attachment, or accessory requires the entire assembly to be replaced. Include warranty information for primary components of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.6.6 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 O&M procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.6.7 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.

1.6.6.8 Contractor/Supplier Listing and Contact Information

Provide a list that includes the name, address, telephone number, email, and website 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.

1.6.7 Part 4: Facility Operations

1.6.7.1 Completed Facility Operating Plan

Provide a plan that documents the procedures for the operation of systems and assemblies in the facility. The systems that should be included in the Operating Plan include, but are not limited to:

a. Electrical systems and equipment

b. Mechanical systems and equipment

c. Fire Protection systems and equipment

d. Control Systems and equipment

e. Architectural and Structural systems, fixtures, structures, and equipment

f. Vertical transportation such as elevators and escalators

1.6.7.2 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.

1.6.7.3 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.

1.6.7.4 Approved Field Test Reports and Manufacturer's Field Reports

Compile and provide approved Field Test Reports (SD-06) and Manufacturer's Field Reports (SD-09) submittals.

1.6.7.5 Maintenance Plans, Procedures, Checklists, Records, and Spare Parts Inventory

1.6.7.5.1 Maintenance Schedules

Include recommended maintenance schedules for systems and equipment.

1.6.7.5.2 Ongoing Commissioning O&M Record Keeping

Include ongoing commissioning and optimization procedures and documentation to monitor and improve the performance of facility systems.

1.6.7.5.3 Janitorial and Cleaning Plans and Procedures

Include a copy of facility cleaning and janitorial plan with procedures and intended chemicals and equipment.

Provide environmentally friendly cleaning recommendations in accordance with ASTM E1971.

1.6.7.6 Utility Record Drawings

1.6.7.6.1 Utility Schematic Diagrams

Provide a one-line schematic diagram for each utility system such as power, water, wastewater, and gas/fuel. Schematic diagram must show from the point where the utility line is connected to the mainline up to the 5 foot connection point to the facility. Indicate location or area designation for route of transmission or distribution lines; locations of duct banks, manholes/handholes or poles; isolation units such as valves and switches; and utility facilities such as pump stations, lift stations, and substations.

1.6.7.6.2 Enlarged Connection and Cutoff Plans

Provide enlarged floor plans and provide information between the 5 foot utilities connection point and where utilities connect to facility distribution. Enlarge floor plans/elevations of the rooms where the utility enters the building and indicate on these plans the locations of the main interiors and exterior connection and cutoff points for the utilities. Also enlarge floor plans/elevations of the rooms where equipment is located. Include enough information to enable someone unfamiliar with the facility to locate the connection and cutoff points. Indicate designations such as room number, panel number, circuit breaker, or valve number of each utility and equipment connection and cutoff point, and what that connection and cutoff point controls.

1.6.7.6.2.1 Description of Utility Metering and Monitoring Systems

Provide in narrative format a description of the utility metering and monitoring systems. Include locations, function, and related systems.

1.6.7.6.2.2 Procedures for Tracking Utility Use and Reporting

Procedures for usage reporting and tracking in support of establishing and monitoring utility budgets and costs, and in developing annual energy reports.

1.6.7.6.2.3 One-Line Diagrams and Meter Location of System

Provide one-line diagrams and design drawings that highlight meter locations on the site.

1.6.7.6.3 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.

1.6.8 Part 5: Training

Provide a copy of training plans used for each type of equipment along with training materials used, arranged in specification sequence. Provide a copy of training records, sign-in sheets, and agendas. Include training and documentation on the updating and continued use of the O&M Manual.

1.6.9 Part 6: Cx Project Report and TAB Report

Provide the final Cx Plan and complete Cx reports with evaluation and testing forms and records for each building system. Include relevant commissioned system assemblies test reports including installers checklists of assemblies. Provide all Cx Progress Reports, issues and resolutions logs with resolution or status of each item, and a list of any open items and seasonal or additional testing required.

1.6.10 Part 7: Regulatory Requirements

Provide information describing regulatory and policies compliance requirements or provide a reference to where it is stored.

1.6.11 Part 8: Permits

Provide information requiring frequently asked questions and associated answers or provide a reference to where it is stored.

1.6.12 Part 9: Operations and Maintenance Manual Approval

Provide a signed document stating that the project O&M Manual has been reviewed and confirming agreement with the approach it presents. Include contact information for the signer for coordination of any future changes.

1.7 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. O&M Data Packages are one of the components of the O&M Manual. The

information required in each type of data package follows:

1.7.1 Package Quality

Documents must be fully legible. O&M data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.7.2 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

1.7.3 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

1.7.4 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

1.7.5 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

1.7.6 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

1.7.7 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.

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 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 O&M Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS. Training must include classroom or field lectures based on the system operating requirements. 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. Training plan must be approved by the QC Manager and the Commissioning Authority (CxA) prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and QC Manager and the CxA. 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 O&M information. The QC Manager and the CxA is responsible for overseeing and approving the content and adequacy of the training. 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 O&M 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 O&M Manual Preparer for inclusion into the Manual's documentation.

3.1.7 Quality Control Coordination

Coordinate this training with the QC Manager and the CxA in accordance with Section 01 45 00 QUALITY CONTROL .

3.2 SUBMITTAL SCHEDULING

3.2.1 Operation and Maintenance Manual, Progress Submittal

Submit the Progress submittal when construction is approximately 50 percent complete, to the Contracting Officer for approval. Provide O&M Manual Files (Bookmarked PDF). Include the elements and portions of system construction completed up to this point. The purpose of this submittal is to verify progress is in accordance with contract requirements as discussed during the O&M Manual Coordination Meeting.

3.2.2 Operation and Maintenance Manual, Prefinal Submittal

Submit the 100 percent submittal of the O&M Prefinal Submittal to the Contracting Officer for approval within 60 calendar days of the Beneficial Occupancy Date (BOD). This submittal must provide a complete, working document that can be used to operate and maintain the facility. Any portion of the submittal that is incomplete or inaccurate requires the entire submittal to be returned for correction. Any discrepancies discovered during the Government's review of the O&M Progress submittal must be corrected prior to the Prefinal submission. The Prefinal Submittal must include O&M Manual Files (Bookmarked PDF).

3.2.3 Operation and Maintenance Manual, Final Submittal

Submit completed O&M Manual Files (Bookmarked PDF). The Final submittal is due at BOD. Any discrepancies discovered during the Government's review of the Prefinal submittal, including the Field Verification, must be corrected prior to the Final submission.

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SECTION 01 78 30.00 22

GIS DATA DELIVERABLES

02/16

PART 1 GENERAL

1.1 OBJECTIVE

The primary objective of this section is to provide detailed specifications for collection and delivery of geospatial data commonly referred to as Geographic Information System (GIS) data. Additionally, this section shall provide guidance to ensure that all GIS data delivered is compatible and will add value to MCAS Cherry Point's Installation Geospatial Information and Services (IGI&S) GEOdatabase.

Failure to comply with the specifications outlined in this document will result in non-acceptance of data deliverables.

1.1.1 Point of Contact for MCAS Cherry Point

The Point of Contact (POC) for assistance in preparation of GIS deliverables is:

MCAS Cherry Point Facilities Asset Management Department
GIS Section
chpt.gis.omb@usmc.mil

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-11 Closeout Submittals

GIS Data Deliverables

1.3 GOVERNMENT GEOSPATIAL DATA AND SCHEMA

1. The IGI&S repository model schema is based on the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) GEOFidelis Data Model with recurring business driven modifications and or adaptations.

   a. Data will be created and delivered by developing an ARCGIS Personal GEODatabase using ArcGIS 10.1 or higher if a higher version is being utilized by the Government at the time the deliverable is being developed.

   b. The Contractor shall verify the ArcGIS and schema version, via the CM or PM, at the commencement of this contract. All GIS DATA DELIVERABLES will be created in accordance with the current version and these specifications.

   c. The Contractor is responsible for requesting the existing GIS Data, Schema and Domain Properties by means of a Data Request Package (DRP). Receipt of request will include Geospatial

Database table structure, schema, Domain configuration, Attribute text format, i.e., case size as well as Meta Data information.

d. The DRP should be submitted prior to the start of data collection efforts and again on an as needed basis. The Contractor shall ensure that all GIS data has been created and delivered utilizing the most up to date IGI&S GEODatabase schema.

2. The Contractor shall submit a request for a Geospatial DRP to the CM or the PM.

a. Request shall be completely filled out and include all the information as instructed on the data request form.

b. Request only GIS data and or schema for feature classes that are relevant to the contract and within the boundary of project area.

c. Utilize associated Government modified domain structure(s).

d. Attach Scope of Work, which is defined by this GIS DATA DELIVERABLES section for each project request.

e. Return the DRP to the CM or PM for sponsorship and submittal to the Installation Geospatial Information & Services (IGI&S) Office.

f. Incomplete forms may delay receipt of the requested GIS data and Schema.

The following Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) website may offer definitions for Feature data sets; Feature Classes and other applicable information. However, please note that specific Schema or Domain modifications are not available via this resource:

http://www.sdsfieonline.org/

1.3.1 Global Positioning System (GPS) and Spatial Reference Properties

GPS data shall be completed in accordance with the GPS Data Collection and Documentation Standards, Version 3 (or higher version if available at the time of this project) as prepared by Geographic Information Coordinating Council (GICC) Statewide Mapping Advisory Committee (SMAC) and adopted by the North Carolina Geographic Information Coordinating Council.

1. Prior to GPS efforts, ALL underground utilities shall be located utilizing a utility locating service in order to verify and obtain accurate feature locations.

2. Only bench marks included in the North Carolina Geodetic Survey Base Station Network shall be used for GPS data collection.

3. Mission planning is essential and Contractor shall utilize the best Position Dilution of Precision (PDOP) values for data accuracy.

4. Utility data, as identified in paragraph "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" will be collected utilizing Survey Grade GPS data collection methods.

5. Infrastructure data, as identified in paragraph "ATTRIBUTE DATA

COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" shall be collected utilizing Sub-Foot or better GPS data collection methods.

a. Spatial accuracy requirements for Survey and Sub-Foot grade data collection are as follows:

i. Sub-Foot requirements
1) All points shall be within + 12 inches
2) 95% accuracy rate for all points.

ii. Survey Grade requirements
1) All points shall be within + 1 centimeter
2) 98% accuracy rate for all points

6. Every effort shall be made to capture feature locations without using offsets. All Offsets will be noted in the Final Report for each feature.

7. Excessive offsets included in the Final Data, which shall be referenced in the Final Report, shall be reviewed for quality control.

a. Resubmittal of data will be required if PDOP planning was not observed per this specification.

The following GEODatabase Coordinate Systems and Spatial Reference Properties should be used for Marine Corps Air Station, Cherry Point:

1. North Carolina Coordinate System of 1983

a. NAD 1983 StatePlane (North American Datum of 1927)
b. FIPS 3200 Feet

2. Domain precision of 1000 which will result in a database accuracy of 1/1000 m

1.3.2 Demolished and Abandoned in Place (AIP) features

The Contractor shall reference all Demolished and or AIP features in the data delivered. Should the current feature data class attributes and or domains not reference AIP or demolished features, the Contractor shall be responsible for appropriately delivering these features by creating an associated "Demolished" or AIP feature class, i.e., CHPT.CP.WastewaterUtilitySegment.

The Contractor shall:

1. Utilize a blank schema for the associated feature class.

2. Rename associated feature class and add DEMO or AIP as a prefix, i.e., DEMO.CHPT.CP.WastewaterUtilitySegment, AIP.CHPT.CP.WastewaterUtilitySegment.

3. All demolished and or AIP features should provide existing spatial and non-spatial data which may be copied from existing data.

4. The Contractor will update attributes appropriately to include the following:

a. Contract Number
b. Drawing Number

c. isDemolished
d. dateDemolished or dateAIP
e. Status

1.3.3 Creating a New Feature Class

Should a new feature class be required that is not readily available in the current GIS schema provided by the Government; the Contractor shall develop the feature class utilizing the schema consistent with the most current version of SDSFIE and document in the Final Report.

1. The Contractor shall include the following modifications (fields) to the schema structure and shall submit all information to the CM or PM for direction and final approval.

   a. Contract Number
   b. Drawing Number

1.3.4 GIS Topology Rules

All data must be created using GIS topology rules for polygons, points and lines, such as, but not limited to the following examples:

1. Polygons, Polylines and points rules; please reference illustrating topology rules in ArcGIS at www.esri.com.

2. Polygons must not have slivers.

3. All utility or infrastructure system data, which is, but is not limited to, transportation system and electrical, water, steam distribution, and wastewater collection, etc., will be created using GIS spatial connectivity rules which specify that vertex, edge and endpoints be snapped to features within the system.

4. Features will be snapped to the appropriate item.

5. Data will be created to represent the real world, for example, water, sewer and transportations systems, etc. will be drawn and or created in the direction of flow.

6. Utility and transportation systems will be created from source to sink, etc.

7. Abandoned In Place (AIP) utility lines will be located and updated in the current feature data set and identified as AIP in the attribute table.

1.3.5 Creation of Geographic Data Documentation (METADATA)

For each digital file delivered containing geographic information, the Contractor shall provide documentation consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM). Both 'GEOFidelis Mandatory' and 'FGDC Mandatory' fields shall be completed for each geographic data set.

The Geospatial Information & Services (IGI&S) Metadata Authoring Guide is included in the DRP package.

Metadata generation tools included in the ArcGIS suite of software (or

equivalent technology) shall be used in the production of the required metadata in XML format. Regardless of the tools used for metadata creation, the Contractor must ensure that the metadata is delivered in XML format and can be easily imported into the IGI&S GEODatabase. A copy of the FGDC metadata standard can be obtained on the internet at http://www.fgdc.gov or by contacting:

Federal Geographic Data Committee
590 National Center
Reston, Virginia 20192
Email: fgdc@fgdc.gov

(NOTE: The metadata should be formatted from the Government perspective, not the Contractor project perspective. Therefore such items as Point of Contact (POC) should be the POC currently associated with the data and NOT the Contractor's Project Manager. The Contractor shall use language and format consistent with existing metadata.)

1.3.6 New Feature Class Requirements

When developing a new feature class, the Contractor shall develop the initial structure consistent with the most current version of SDSFIE.

a. If further modifications to the database structure are required, the Contractor shall consult with the Government Project Manager for direction and final approval.

b. All new feature data classes shall be created in compliance with SDSFIE noted on the final report.

1.3.7 GIS Submittals Guidelines

All GIS Submittals will be submitted to the CM or PM and then analyzed by Government GIS personnel prior to final approval. Failure to comply with the specifications outlined in this document will result in non-acceptance of data deliverables.

1. Prior to any database development, the Contractor shall provide the Government with a technical approach document for review and approval. The Technical Approach document will describe in detail the Contractor's technical approach to designing and developing the database.

2. All attributes shall be populated in accordance with the "ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES" and shall be obtained via contract specifications, plans and record drawings.

3. The Contractor may be required to conduct research, collect data and make copies of reports and studies as necessary to verify existing and/or record drawing data. Record drawing data and closed contracts can be located in the Technical Records Section in the Public Works Department.

4. Raw GPS data and collection data files shall be included with every phase of delivery.

5. Actual spatial and non-spatial conditions in the field always supersede drawings. It is the Contractor's responsibility to locate and field verify all features to ensure attribute data and location is

correctly recorded.

6. The Contractor shall submit a preliminary review of data at 15 to 25 percent contract completion to ensure specifications compliance.

7. The Contractor shall deliver digital geographic maps, GPS collection files and related data. All working text and documents and personal geodatabase shall be included for review in the draft and final delivery of data.

   a. All maps of GIS DATA DELIVERABLES will be ANSI C size and include a project title, contract number, scale, legend, standard symbology, attributes, i.e., building numbers, road names, segment diameters, etc.

8. The Contractor may be required to provide a technical consultant to meet on site.

9. The Contractor shall not deliver blank unused schema or feature class data with no attributes. Deliver only data pertinent to the contract that adds value to the GEODatabase per this section.

10. The Contractor shall deliver GIS Data at the end of each phase for all Phased Projects and Construction projects.

11. The Contractor accepts the responsibility to perform quality assurance for all data and related materials required in the section prior to submitting product to the Government.

12. The data will be analyzed for discrepancies in subject content, correct format in accordance with this statement of work, and compatibility with the existing GIS system as well as all other specifications in this section.

1.3.8 Formats, Versions and Guidelines

All data deliverables will be in the following formats and/or versions.

1. GIS data will be provided in an ArcGIS 10.1 or higher if a higher version is being used by the Government at the time of this project. The Contractor shall verify the ArcGIS version, via the CM or PM at the commencement of this contract.

2. Microsoft Office (MS) Suite data shall be delivered in MS 2010.

3. Microsoft Windows 7 operating system, unless otherwise approved by the Government.

4. All reports and maps will be delivered as a hard copy and in a searchable Adobe Portable Document Format (PDF).

5. All text, spreadsheet, and database files, reports and maps shall be delivered on Compact Disc read - only memory (CD-ROM) or Digital Versatile Disc read - only memory (DVD-ROM).

6. The Contractor shall verify required version(s) of software and schema, via the CM or PM.

7. Map submittals shall accompany each geospatial deliverable.

a. Include ANSI C map for each project/area.
b. Data should be labeled and attributed per specification.
c. All maps should include the date, a legend, scale, contract title and number.

1.3.9 Final Report Requirements with additional Guidelines

The Contractor shall follow the following:

1. Specific procedures and list of equipment, software and versions that were utilized for the GPS data collection and creation of geospatial data.

2. Submit all GPS data files.

3. Provide the date(s) the IGI&S schema and geospatial data was received.

4. Provide steps taken to create the GEODatabase.

5. Provide details on any offsets to include justification as to why offsets were utilized and on which features and or points offsets were used.

6. Describe all modifications to the geodatabase to include the name of all new features classes, i.e., new, demolished or AIP.

7. Provide the source that was utilized for required attributes.

   a. Include an ANSI C size copy of all design drawings that were referenced in the attribute data. This information should be included in all phases of delivery to include draft and final reviews.

   b. Provide the overall utility site plan drawing(s)with each submittal.

8. Specify Deliverable "Draft #" or "Final Submittal" when data is submitted to the CM or PM for review.

9. Provide the name and contact information for the GIS Technical Point of Contact who can answer questions regarding the data deliverable.

10. GIS DATA DELIVERABLES must be provided in a format that does not require translation or pre/post processing prior to being loaded into the IGI&S GEODatabase.

11. Provide any miscellaneous information that the Contractor deems significant.

12. Provide the current version of the GIS DATA DELIVERABLES specification utilized for this contract submittal.

1.3.10 Ownership

All digital files, final hardcopy products, GPS raw data, source data acquired for this project, and related materials, including that furnished by the Government, shall become the property of the Government and will not be issued, posted, distributed, or published by the Contractor.

Note: No endorsement of software or hardware is implied.

1.4 ATTRIBUTE DATA COLLECTION AND GPS REQUIREMENTS FOR SPECIFIC FEATURES

For Attributes and Data Collection of specific MCAS Cherry Point features please consult the Cherry Point IGI&S Manager, chpt.gis.omb@usmc.mil, for a checklist and copy of the most recent Data Dictionary.

1.4.1 Non-Compliance

Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Note: Geospatial data delivery does not replace record drawing requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 80 00

REPORTS
04/15

PART 1 GENERAL

1.1 REPORTS INCLUDED

1.1.1 Asbestos and Lead Paint Inspection Report

Asbestos and Lead-Containing Paint Assessment performed by ECS

1.2 USE OF INFORMATION

1.2.1 Warranty

The information disclosed in the referenced reports is based on data obtained in specific locations and is assumed to be representative of conditions throughout the site. This information is furnished without warranty and is only for general information to be used by the contractor in the preparation of his bid and work schedule. It is not intended as a replacement for personal investigation and judgment, or interpretation of the information furnished, as required of the contractor in the performance of this contract.

1.2.2 Site Visit

Bidders should visit the site and acquaint themselves with all existing conditions prior to preparing their bid. This will include a review of the conditions contained in the enclosed report as they relate to the site. The contractor is responsible for including in his bid and work schedule, procedures for handling existing site conditions delineated in the included reports in accord with applicable laws and regulations as those conditions may affect the work.

1.2.3 Application of Information

Recommendations contained in the reports are to be used by the contractor only to the extent that these recommendations comply with applicable laws, regulations, and other sections of the these specifications.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 VARYING CONDITIONS

If during the course of the work, conditions are encountered which are not covered in the included reports or are different from conditions that would be reasonably anticipated from the included reports, the contractor shall immediately notify the Contracting Officer. If such conditions are hazardous or the continuation of work would cause a hazardous condition to develop, he shall stop work and proceed as directed by the Contracting Officer as directed by provisions contained in other sections of this specification. This may include modifications to, or the development of a

new, Health and Safety Plan for this project, and alternate or additional appropriate abatement procedures.

3.2 CHANGES TO THE CONTRACT

Any changes to the contract made as a result of site conditions which differ from those delineated in the report may result in an adjustment of the contract amount. The adjustment will be an increase or decrease depending on the scope and nature of the change and will be in accord with other provisions of these specifications.

-- End of Section --

HAZARDOUS MATERIALS SURVEY

BUILDING 153 - POST OFFICE

MCAS CHERRY POINT
HAVELOCK, NORTH CAROLINA 28533

ECS PROJECT NO. 49:21422

FOR: MBF ARCHITECTS PA

APRIL 14, 2024

April 14, 2024

Mr. Bill Faulkenberry
MBF Architects PA
317-C Pollock Street
New Bern, North Carolina 28560
faulkenberry@mbfarchitects.com

ECS Project No. 49:21422

Reference: Hazardous Materials Survey, Building 153 - Post Office, MCAS Cherry Point, Havelock, North Carolina

Dear Mr. Faulkenberry:

ECS Southeast, LLC (ECS) is pleased to provide MBF Architects PA with the results of the above referenced Hazardous Materials Survey performed in Building 153 located at Marine Corp Air Station (MCAS) Cherry Point in Havelock, North Carolina. This report summarizes our observations, analytical results, findings, and recommendations related to the work performed. The work described in this report was performed by ECS in general accordance with the Scope of Services described in ECS Proposal Number 49:38795P and the terms and conditions of the agreement authorizing those services.

ECS appreciates this opportunity to provide MBF Architects PA with our services. If we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

ECS Southeast, LLC

Braxton B. Dawson
Environmental Project Manager
bdawson@ecslimited.com
910-686-9114

Lindsey Thompson, REM
Environmental Principal
lthompson@ecslimited.com
864-987-1810

EXECUTIVE SUMMARY

The property consists of Building 153, located at Marine Corps Air Station (MCAS) in Cherry Point, North Carolina. Based on the information available, Building 153 is shared by the United States Postal Service (USPS) and MCAS post office. The post office building is reportedly being relocated to Building 3918 and is currently slated for demolition. ECS was contracted to perform an asbestos and lead paint survey prior to the proposed demolition of the building.

The purpose of the survey was to determine if asbestos-containing materials (ACMs) or lead-containing paint (LCP) are present on the subject property. The survey was performed within the interior and exterior areas of the subject building, as well as the roof.

Asbestos Survey

On April 4, 2025, Mr. Braxton B. Dawson, a North Carolina accredited asbestos inspector, performed the asbestos assessment. Bulk samples were submitted to Scientific Analytical Institute, Inc. (SAI) in Greensboro, North Carolina for analysis via Polarized Light Microscopy (PLM) in accordance with the current EPA-600 methodology.

A total of 25 bulk samples from 12 homogeneous areas were submitted to the laboratory, of which 29 layers were analyzed. Based on the laboratory analysis of the bulk samples collected during the survey, the following materials were reported to be asbestos-containing:

- Textured surfacing material located on walls in the back USPS hallway (600 Square Feet).

Due to inaccessibility or the destructive means that asbestos sampling requires, unseen ACMs may remain within the building hidden behind inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, sub-grade sealants, flooring located below underlayments, areas behind exterior walls, pipe trenches, and subsurface utilities, etc.

If suspect materials are discovered during construction activities, they should be presumed to contain asbestos and be treated as ACMs or be sampled immediately upon discovery and prior to disturbance for asbestos content by an accredited or certified asbestos inspector in accordance with 29 Code of Federal Regulations (CFR) 1926.1101.

Lead Paint Survey

The lead paint assessment was conducted by collection of paint chip samples from suspect lead paint materials. The paint chip samples were submitted to a laboratory that participates in the American Industrial Hygiene Association (AIHA) Environmental Lead Proficiency Analytical Testing (ELPAT) Programs for analysis of lead concentration (percent by weight) using Flame Atomic Absorption Spectroscopy.

Based on the laboratory analysis of the paint chips collected during the survey, the following building components were reported as lead-containing paint (LCP) or assumed:

- White exterior wood siding under vinyl siding;
- White exterior metal columns at exterior loading dock;

- White wood door casings at exterior loading dock;
- White pressboard walls in the MCAS side;
- White wood window trim throughout; and
- Beige concrete walls in the USPS vault.

Paint and surface coatings which contain detectable concentrations of lead are considered LCPs. Since OSHA has no specific action level for lead in paint, all paint on the site found to have a measurable concentration of lead should be assumed to be lead-containing. Work performed which may disturb LCP is regulated under OSHA as referenced under 29 CFR 1926.62.

Recommendations regarding the removal and disposal of the ACM and LCP identified by ECS can be found in Section 5.0 of this report.

The executive summary is an integral portion of this report, however, ECS recommends the report be read in its entirety.

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Appendix IV: Lead Laboratory Analytical Results

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1.0 SITE DESCRIPTION

The property consists of Building 153 located at Marine Corps Air Station (MCAS) in Cherry Point, North Carolina. Based on the information available, Building 153 is shared by the United States Postal Service (USPS) and MCAS post office. The post office building is reportedly being relocated into Building 3918 and is currently slated for demolition. ECS was contracted to perform an asbestos and lead paint survey prior to the proposed demolition of the building.

2.0 PURPOSE

The purpose of the Hazardous Materials Survey was to identify asbestos-containing materials (ACMs) and lead-containing paint (LCP) which require special handling and/or disposal if disturbed during construction activities. The identification of ACMs require trained labor, regulated work practices, and special disposal. The identification of LBP or other lead hazards requires disclosure to contractors and monitoring of lead exposure. The identification of other regulated materials such as universal waste may require personal protective equipment, training, special handling, packaging, and disposal.

3.0 METHODOLOGY

ECS performed the authorized Scope of Services in general accordance with our proposal, standard industry practice(s) and methods specified by regulation(s) for the identification of ACMs and LCPs.

3.1 Asbestos-Containing Materials

The asbestos survey was performed by Mr. Braxton B. Dawson (NC Asbestos Inspector No. 12830) on April 4, 2025. The survey consisted of observing the accessible areas of the building for the presence of suspect materials which may contain asbestos. The survey involved detecting both friable materials (materials which can be pulverized or reduced to a powder by hand pressure when dry) and non-friable materials (materials which pose a hazard when sawn, sanded, drilled or pulverized). Homogeneous materials (based on material type, color, texture, etc.) were identified in during the survey.

The EPA National Emissions Standard for Hazardous Air Pollutants (NESHAP) requires a survey for asbestos prior to renovation or demolition. Demolition is defined under NESHAP as the removal of a load-bearing structural member and renovation is an action which disturbs building materials. On the basis of requirements under NESHAP and North Carolina Asbestos Hazard Management Program (AHMP), administered by the Health Hazards Control Unit (HHCU), for renovation or demolition activities, ECS conducted a limited survey for potential ACM. The ACM survey was limited in that we did not conduct demolition such as jack/sledgehammering to expose potentially concealed materials. Samples were collected in general accordance with Environmental Protection Agency (EPA) Standard 40 CFR 763 Subpart E, Asbestos Hazard Emergency Response Act (AHERA) and Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1926.1101 Inspection Protocol.

In order to determine if the suspect materials observed during the visual survey contained asbestos, representative bulk samples were collected and placed in sealed packages. Samples were collected during the survey and submitted to SAI for analysis using the Environmental Protection Agency (EPA) recommended method of Polarized Light Microscopy (PLM) coupled with dispersion staining (Method

No. EPA 600/R-93/116). SAI participates in the National Voluntary Laboratory Accreditation Program (NVLAP). Their NVLAP accreditation number is 200664-0. Several of the samples were layered and analyzed as multiple samples. EPA regulations require that multiple samples of each homogeneous area be collected for laboratory analysis. The material type, sample location, and analytical results of each bulk sample are also summarized in the attached Asbestos Bulk Analysis report in **Appendices**.

Samples were analyzed using "Positive Stop" methodology. If one sample of a homogeneous material is reported to contain asbestos, the remaining samples of that material are not analyzed. If one sample of a material from a homogeneous area is reported to contain greater than 1% asbestos, then by EPA definition, it is characterized as an ACM regardless of additional analysis.

During the survey, ECS attempted to identify suspect ACMs in readily accessible areas. However, due to the destructive means required to identify some materials, certain areas were deemed inaccessible (i.e. behind walls or sub grade materials) and were not surveyed for suspect ACMs.

3.2 Lead in Paint and Surface Coatings

ECS completed a lead paint screening within the building as part of our assessment activities. The collection of representative paint chip samples was performed throughout the building. Samples collected were containerized, labeled, and transported to SAI. Each of the paint chip samples was subsequently analyzed for the presence of lead reported in percent lead by weight via EPA Method SW 846, 7000B (Flame AAS). The chain-of-custody, which includes sample numbers and sample locations, is included in an Appendix of this report.

4.0 RESULTS

The following is a summary of laboratory results, findings and observations.

4.1 Asbestos Sampling

In total, 25 bulk samples from 12 homogeneous areas were submitted to the laboratory, of which 29 layers were analyzed.

An ACM is defined as any material containing more than one percent (>1%) asbestos as determined using the method specified in Appendix E, Subpart E, 40 CFR Part 763, Section 1, PLM. Materials are categorized by the U.S. EPA in the following categories:

- Friable ACMs are defined as any ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Non-friable ACMs are defined as any ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I non-friable ACM are listed as the following: packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than one percent (>1%) asbestos.
- Category II non-friable ACM are listed as any material, excluding Category I non-friable ACM, containing more than one percent (>1%) asbestos.

Regulated Asbestos-Containing Materials (RACM) are friable ACM or non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or has crumbled, been pulverized, or reduced to powder in the course of renovation and/or demolition operations.

Scientific Analytical Institute, Inc. submitted a signed final laboratory report to ECS on December 14, 2023. Several of the bulk samples submitted for analysis were reported to contain asbestos in detectable concentrations. A complete list of the sampled materials submitted for analysis, sample locations, and photographs of representative building materials are located in the Appendices of this report.

Summary of Asbestos-Containing Materials Identified

Sample ID	Material Location	Material Description	Analytical Results	Category	Estimated Quantity
HA12-1,2,3	USPS Back Hallway	Textured Wall Coating	Tile - 3% Chrysotile	RACM, Friable	600 Square Feet

The above provided approximate quantities of the identified ACMs are for informational purposes only and should not be used for bidding purposes. ECS does not warranty or guarantee the estimated quantities provided. The contractors bidding on asbestos abatement work should visit the site prior to bidding to field verify the estimated quantities of ACMs and become familiar with the site conditions and address any technical or engineering considerations with respect to asbestos removal in their bids or estimates. Any similar materials located on the property should also be assumed to contain asbestos unless tested and the laboratory analysis indicates that asbestos is not present.

4.2 Suspect or Assumed Asbestos-Containing Materials

Due to the inaccessibility or the destructive means that asbestos sampling requires, additional suspect ACMs may remain within the building hidden behind inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, sub-grade sealants, flooring located below underlayments, areas behind exterior walls, pipe trenches, and subsurface utilities, etc. These areas were deemed inaccessible and were not assessed.

If these materials are discovered during construction activities, they should be presumed to contain asbestos and be treated as ACMs or be sampled immediately upon discovery and prior to disturbance for asbestos content by a certified asbestos inspector in accordance with 29 CFR 1926.1101.

4.3 Lead in Paint and Surface Coatings

Paint and surface coatings which contain detectable concentrations of lead considered “lead-containing paints” (LCP). Since OSHA has no specific action level for lead in paint, all paint on the site found to have a measurable concentration of lead should be assumed to be lead containing. Work performed which may disturb lead-containing paint is regulated under OSHA as referenced under 29 CFR 1926.62.

Lead was detected in the paint chip samples analyzed. Lead-containing paints identified are summarized in the table below and photographs are located in the Appendix.

Summary Lead-Containing Paint

Sample ID	Location	Substrate	Component	Color	Result
PC-1	Exterior under Vinyl Siding	Wood	Siding	White	0.96%
PC-2	Exterior Loading Dock	Metal	Columns	White	.0022%
PC-8	Exterior Loading Dock	Wood	Door Casings	White	0.032%
PC-17	MCAS Side Walls	Press board	Walls	White	0.099%
PC-18	Windows Throughout	Wood	Window Trim	White	0.085%
PC-19	USPS Vault	CMU	Walls	Beige	0.33%

5.0 RECOMMENDATIONS AND REGULATORY REQUIREMENTS

Based on our understanding of the purpose of the Hazardous Materials Survey, the results of laboratory analysis, and our findings and observations, ECS presents the following recommendations.

5.1 Asbestos-Containing Materials

ECS recommends where a material type has been identified as asbestos-containing that other materials with similar color, texture, age and size throughout the building's interior and exterior be assumed to contain asbestos. Please refer to Section 4.1 for a complete list of building materials that were reported positive for asbestos and to Section 4.2 for materials that were assumed to contain asbestos.

If ACMs are to be removed, it is recommended that an industrial hygienist monitor the project. This involves collecting air samples from within and outside abatement work areas to monitor the asbestos abatement contractor's work practices over the course of the project. The industrial hygienist should evaluate if the asbestos abatement work is in accordance with project specifications, U.S. EPA regulation 40 CFR Part 61-National Emission Standards for Hazardous Air Pollutants Subpart M: National Emission Standard for Asbestos, and U.S. Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1926.1101 – Asbestos in Construction. The industrial hygienist should assess each work area to monitor the removal of ACMs. Only after the industrial hygienist has determined the identified ACMs have been removed should final clearance air samples be collected (if necessary).

Suspect ACMs not observed due to inaccessibility or not sampled due to the destructive means that sampling would require may also be encountered during construction activities. At the time of the survey, only limited destructive means were used to locate or sample suspect ACMs; therefore, additional suspect ACMs may remain within inaccessible areas that include, but are not limited to, [sub-grade walls, structural members, topping slabs, exterior areas, sub-grade sealants, flooring located below underlayments, vapor barriers, pipe trenches and other subsurface utilities, etc.] If additional suspect ACMs are uncovered which were not accessible during this survey, it is recommended that these materials either be assumed to contain asbestos or be sampled prior to disturbance upon discovery for asbestos content by an asbestos inspector in accordance with 29 CFR 1926.1101.

5.2 Lead in Paint and Surface Coatings

Based on the findings of the lead survey, detectable concentrations of lead were identified on some paints and surface coatings.

The presence of lead is a concern primarily when conditions exist where it may be inhaled or ingested. Regardless of the analytical results of a material, all painted and/or glazed surfaces may still contain concentrations of lead in the paint, which when disturbed, may generate lead dust greater than the Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter (ug/m3) as an 8-hour Time Weighted Average (TWA) established by the OSHA "Lead Exposure in Construction Rule (29 CFR 1926.62)."

The OSHA standard gives no guidance on acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected. Rather, OSHA defines airborne concentrations, and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during any removal/demolition process (as appropriate) to verify that actual personal exposures are below the (PEL of 50 $\mu g/m^3$ as an 8-hour TWA. Under OSHA requirements, the contractor performing renovation work will be required to conduct this monitoring and follow applicable requirements under 29 CFR 1926.62 if disturbing lead-containing paint.

6.0 LIMITATIONS

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.

Our recommendations are in part based on federal, state, and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies, any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.

Appendix I: Figures

Asbestos and Lead Survey

Figure 1

Site Overview

Demolish Building 153
Marine Corps. Air Station Cherry Point
Havelock, North Carolina

ECS Project No. 49-21422

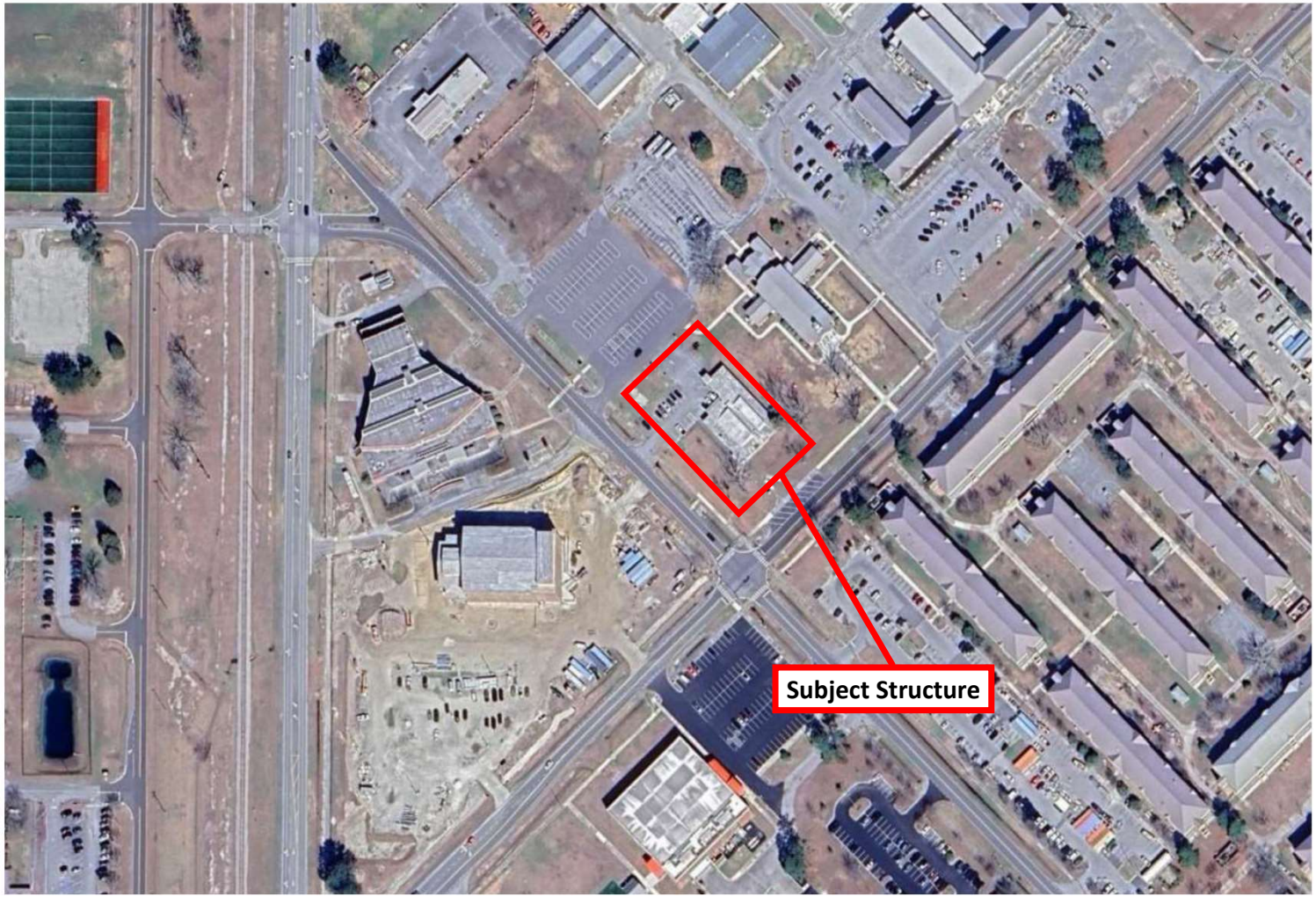


IMAGE SOURCE:

Google Earth

N

Asbestos and Lead Survey

Figure 2

Asbestos and Lead Sample Locations

Demolish Building 153
Marine Corps. Air Station Cherry Point
Havelock, North Carolina

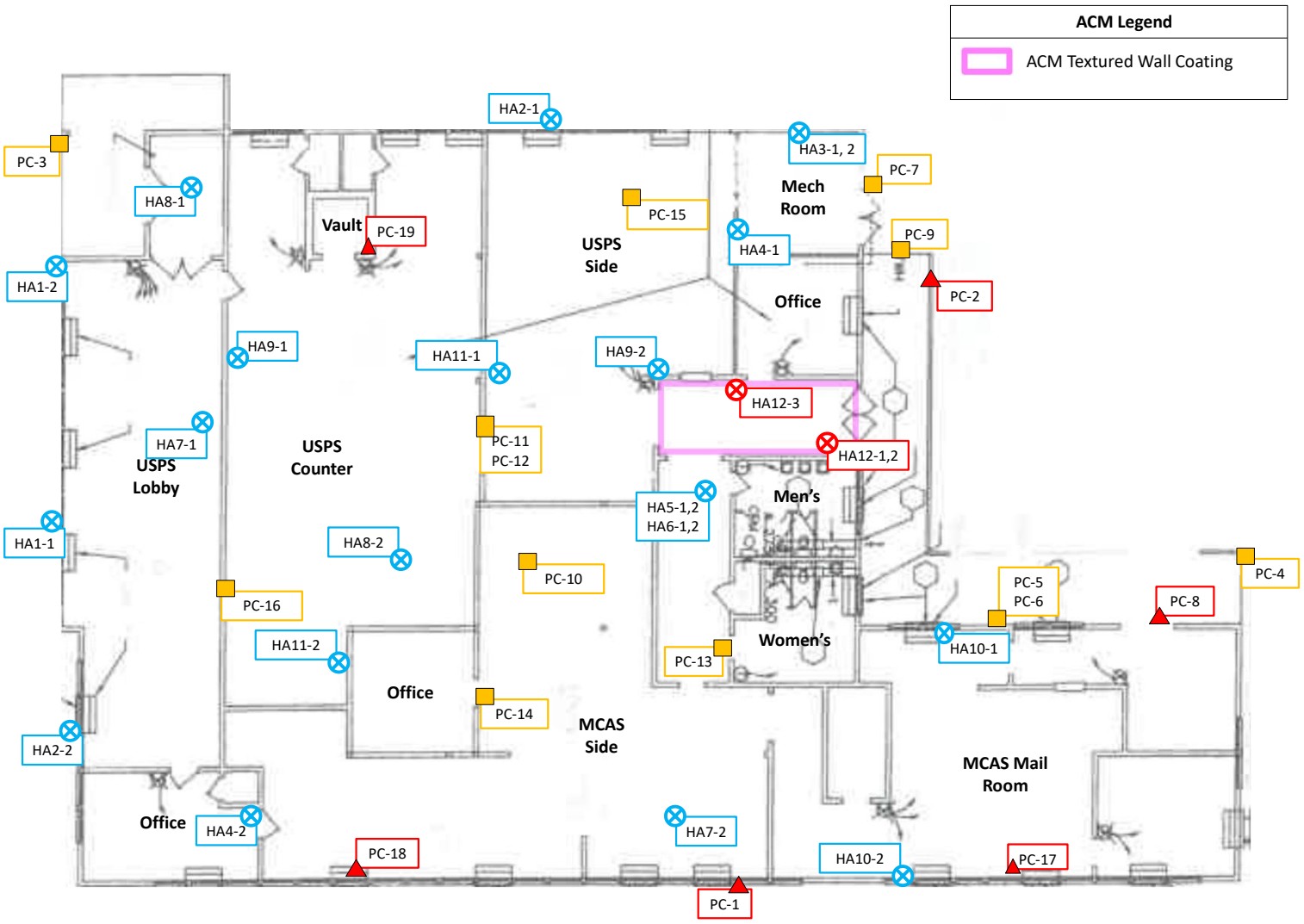
ECS Project No. 49-21422

SAMPLE LEGEND:

- XX-XX — Sample Location
- Asbestos Not Detected
- Asbestos Detected
- Lead Below Detection Limit
- Lead-Containing Paint

NOTES:

Floor plan not to scale.



Appendix II: Site Photographs

1 - View of the subject building.

2 - View of the back of the building.

3 - View of the side of the building.

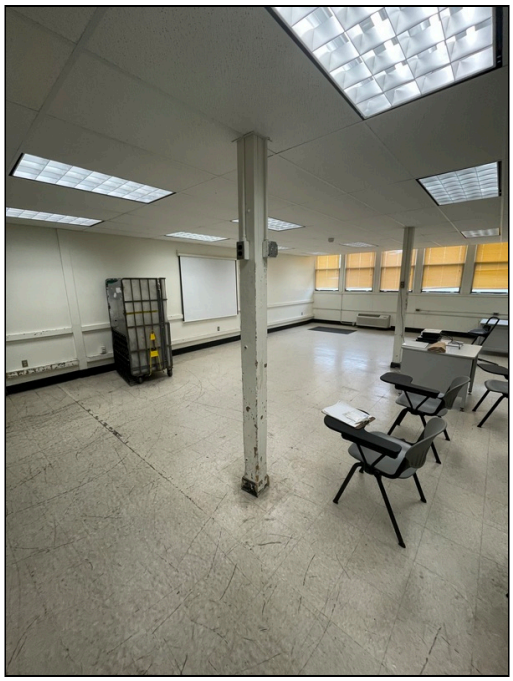
4 - View of the roof.

5 - View of typical fiberglass pipe insulation.

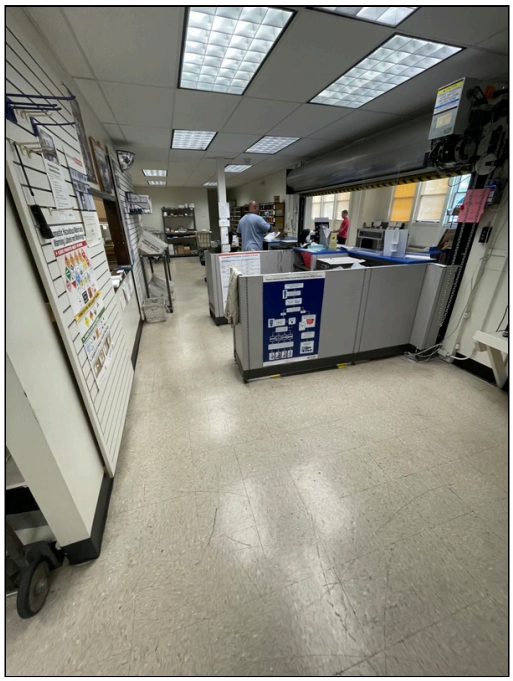
6 - View of the mechanical room.

7 - View of the asbestos-containing wall texture located in the USPS back hallway.

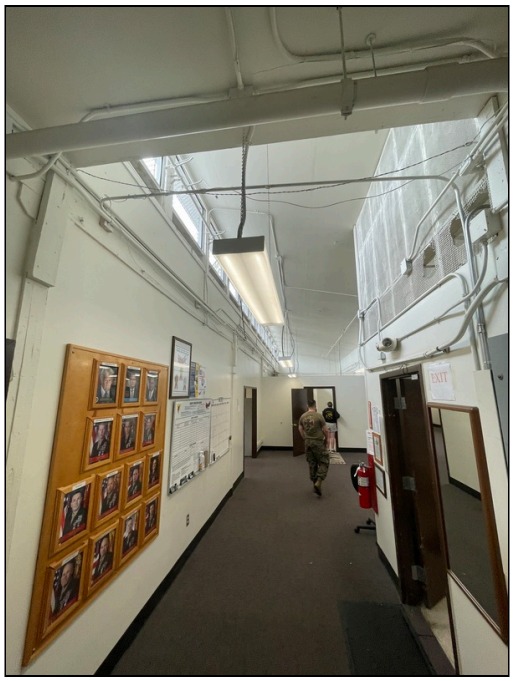
8 - View of the USPS back hallway.



9 - View of the USPS back area.



10 - View of the USPS front lobby.



11 - View of the MCAS side.

12 - View of the original wood siding with LBP.

13 - View of the loading dock.

14 - View of the typical roofing materials.

15 - View of the USPS vault.

Appendix III: Asbestos Bulk Sample Results

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079486**
Analysis: PLM
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
HA1-1	Masonry Caulk	**None Detected**		**100% Other**	Gray, White Non-Fibrous Homogeneous
10079486_0001					Ashed
HA1-2	Masonry Caulk	**None Detected**		**100% Other**	Gray, White Non-Fibrous Homogeneous
10079486_0002					Ashed
HA2-1	HVAC Caulk	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10079486_0003					Ashed
HA2-2	HVAC Caulk	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10079486_0004					Ashed
HA3-1	Tar Paper Sheathing	**None Detected**	**60% Cellulose**	**40% Other**	White, Black Fibrous Heterogeneous
10079486_0005					Teased, Dissolved
HA3-2	Tar Paper Sheathing	**None Detected**	**60% Cellulose**	**40% Other**	Black, White Fibrous Heterogeneous
10079486_0006					Dissolved, Teased
HA4-1	Old Drywall	**None Detected**	**10% Cellulose**	**90% Other**	Gray, Brown Non-Fibrous Homogeneous
10079486_0007					Teased
HA4-2	Old Drywall	**None Detected**	**10% Cellulose**	**90% Other**	Brown, Gray Non-Fibrous Homogeneous
10079486_0008					Teased

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Byron Stroble (29)
Analyst

Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079486**
Analysis: PLM
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
HA5-1	Roofing - Elastomeric Coating and Membrane	**None Detected**	**40% Cellulose**	**60% Other**	White, Black Fibrous Heterogeneous
10079486_0009					Teased, Dissolved
HA5-2	Roofing - Elastomeric Coating and Membrane	**None Detected**	**40% Cellulose**	**60% Other**	Black, White Fibrous Heterogeneous
10079486_0010					Dissolved, Teased
HA6-1	Roofing - Bottom Bituminous Layer	**None Detected**	**60% Cellulose**	**40% Other**	Black, Brown Fibrous Heterogeneous
10079486_0011					Dissolved, Teased
HA6-2	Roofing - Bottom Bituminous Layer	**None Detected**	**60% Cellulose**	**40% Other**	Black, Brown Fibrous Heterogeneous
10079486_0012					Dissolved, Teased
HA7-1 - A	12" Grey VCT and Yellow Mastic	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10079486_0013	*tile*				Dissolved
HA7-1 - B	12" Grey VCT and Yellow Mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10079486_0026	*mastic*				Dissolved
HA7-2 - A	12" Grey VCT and Yellow Mastic	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10079486_0014	*tile*				Dissolved
HA7-2 - B	12" Grey VCT and Yellow Mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10079486_0027	*mastic*				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Byron Stroble (29)
Analyst

Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079486**
Analysis: PLM
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
HA8-1	2x4 Ceiling Tiles	**None Detected**	**45% Cellulose** **45% Mineral Wool**	**10% Other**	Gray Fibrous Homogeneous
10079486_0015					Teased, Ashed
HA8-2	2x4 Ceiling Tiles	**None Detected**	**45% Cellulose** **45% Mineral Wool**	**10% Other**	Gray Fibrous Homogeneous
10079486_0016					Ashed, Teased
HA9-1	Drywall and Joint Compound	**None Detected**	**10% Cellulose**	**90% Other**	White, Brown Non-Fibrous Heterogeneous
10079486_0017	*drywall: none detected, joint compound: none detected*				Teased
HA9-2	Drywall and Joint Compound	**None Detected**	**10% Cellulose**	**90% Other**	Brown, White Non-Fibrous Heterogeneous
10079486_0018	*drywall: none detected, joint compound: none detected*				Teased
HA10-1	Pressboard Joint Sealant	**None Detected**		**100% Other**	White, Gray Non-Fibrous Homogeneous
10079486_0019					Ashed
HA10-2	Pressboard Joint Sealant	**None Detected**		**100% Other**	Gray, White Non-Fibrous Homogeneous
10079486_0020					Ashed
HA11-1 - A	6" Black Cove Base and Mastic	**None Detected**		**100% Other**	Black Non-Fibrous Homogeneous
10079486_0021	*cove base*				Ashed
HA11-1 - B	6" Black Cove Base and Mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10079486_0028	*mastic*				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Byron Stroble (29)
Analyst

Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079486**
Analysis: PLM
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
HA11-2 - A	6" Black Cove Base and Mastic	**None Detected**		**100% Other**	Black Non-Fibrous Homogeneous
10079486_0022	*cove base*				Ashed
HA11-2 - B	6" Black Cove Base and Mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10079486_0029	*mastic*				Dissolved
HA12-1	Wall Texture Coating	**3% Chrysotile**		**97% Other**	White Non-Fibrous Homogeneous
10079486_0023					Teased
HA12-2	Wall Texture Coating	**Not Analyzed**			
10079486_0024					
HA12-3	Wall Texture Coating	**Not Analyzed**			
10079486_0025					

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Byron Stroble (29)
Analyst

Approved Signatory

Scientific Analytical Institute, Inc. 4604 Dundas Dr. Greensboro, NC 27407 (336) 292-3888

100794866

Client:	ECS Southeast, LLC	
Contact:	Braxton Dawson	
Address:	6714 Netherlands Drive Wilmington, NC 28405	
Phone:	910-899-1289	
Fax:	910-686-9666	
Email:	bdawson@ecslimited.com	
cc:		
Project:	B153 - Post Office MCAS Cherry Point	
Client Notes:		
Date Sampled:	4/4/2025 0:00	
P.O. #.	49-21422	
Date Submitted:	4/4/2025 0:00	
Analysis:	PLM Bulk w/ Positive Stop	
TurnAroundTime:	72-hr TAT	

Instructions:
Use Column "B" for your contact info

To See an Example Click the bottom Example Tab.

Enter samples between "<<" and ">>"
Begin Samples with a "<< "above the first sample and end with a ">>" below the last sample.
Only Enter your data on the first sheet "Sheet1"

Note: Date 1 and Data 2 are optional fields that do not show up on the official report, however they will be included in the electronic data returned to you to facilitate your reintegration of the report data.

Scientific Analytical Institute

4604 Dundas Drive
Greensboro, NC 27407
Phone: 336.292.3888
Fax: 336.292.3313
Email: lab@saitab.com

Sample Number	Notes	Sample Description	Location
<<			
HA1-1		Masonry Caulk	Exterior Brick
HA1-2		Masonry Caulk	Exterior Brick
HA2-1		HVAC Caulk	Exterior PTAC Units
HA2-2		HVAC Caulk	Exterior PTAC Units
HA3-1		Tar Paper Sheathing	Exterior Walls
HA3-2		Tar Paper Sheathing	Exterior Walls
HA4-1		Old Drywall	Mech Room
HA4-2		Old Drywall	Mech Room
HA5-1		Roofing - Elastomeric Coating and Membrane	Roof
HA5-2		Roofing - Elastomeric Coating and Membrane	Roof
HA6-1		Roofing - Bottom Bituminous Layer	Roof
HA6-2		Roofing - Bottom Bituminous Layer	Roof
HA7-1		12" Grey VCT and Yellow Mastic	Primary Flooring
HA7-2		12" Grey VCT and Yellow Mastic	Primary Flooring
HA8-1		2x4 Ceiling Tiles	USPS Side
HA8-2		2x4 Ceiling Tiles	USPS Side
HA9-1		Drywall and Joint Compound	USPS Side
HA9-2		Drywall and Joint Compound	USPS Side
HA10-1		Pressboard Joint Sealant	MCAS Side
HA10-2		Pressboard Joint Sealant	MCAS Side
HA11-1		6" Black Cove Base and Mastic	USPS Side
HA11-2		6" Black Cove Base and Mastic	USPS Side
HA12-1		Wall Texture Coating	USPS Hallway
HA12-2		Wall Texture Coating	USPS Hallway
HA12-3		Wall Texture Coating	USPS Hallway
>>			

Braxton B. Dawson

Accepted ☑

Rejected ☐

Received By
4/9/2025

Appendix IV: Lead Laboratory Analytical Results

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079485**
Analysis: PBP
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Reporting Limit (ppm)	Concentration (ppm)	Concentration (% by weight)
PC-1 / *10079485_0001*	**White Wood Siding**	0.0937	43	9600	**0.96%**
PC-2 / *10079485_0002*	**White Metal Columns**	0.1971	20.	22	**0.0022%**
PC-3 / *10079485_0003*	**White Wood Columns**	0.0593	67	<67	**<0.0067%**
PC-4 / *10079485_0004*	**Yellow Metal Railings**	0.0624	64	<64	**<0.0064%**
PC-5 / *10079485_0005*	**Grey Metal Double Doors**	0.0725	55	<55	**<0.0055%**
PC-6 / *10079485_0006*	**Grey Metal Door Frames**	0.0877	46	<46	**<0.0046%**
PC-7 / *10079485_0007*	**White Aluminum Jacketing**	0.0879	46	<46	**<0.0046%**
PC-8 / *10079485_0008*	**White Wood Door Casings**	0.0570	70.	320	**0.032%**

Disclaimer: Unless otherwise noted blank sample correction was not performed on analytical results. Scientific Analytical Institute participates in the AIHA ELPAT program. ELPAT Laboratory ID: 173190. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. Analytical uncertainty available upon request. The quality control samples run with the samples in this report have passed all EPA required specifications unless otherwise noted. RL: (Report Limit for an undiluted 50ml sample is 4µg Total Pb). All sample dried before preparation and analysis.

Mark Doki (19)
Analyst

Approved Signatory

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079485**
Analysis: PBP
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Reporting Limit (ppm)	Concentration (ppm)	Concentration (% by weight)
PC-9 / *10079485_0009*	**White Wood Fascia**	0.0510	78	<78	**<0.0078%**
PC-10 / *10079485_0010*	**White Elastomeric Roof Coating**	0.1903	21	<21	**<0.0021%**
PC-11 / *10079485_0011*	**Brown/Red Metal Doors**	0.0739	54	<54	**<0.0054%**
PC-12 / *10079485_0012*	**Brown Metal Door Frames**	0.0644	62	<62	**<0.0062%**
PC-13 / *10079485_0013*	**Brown Wood Doors**	0.0637	63	<63	**<0.0063%**
PC-14 / *10079485_0014*	**Brown Wood Door Frames**	0.0653	61	<61	**<0.0061%**
PC-15 / *10079485_0015*	**White Wood Support Columns**	0.0863	46	<46	**<0.0046%**
PC-16 / *10079485_0016*	**White Drywall Walls**	0.0745	54	<54	**<0.0054%**

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Mark Doki (19)
Analyst

Approved Signatory

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: B153 - Post Office MCAS Cherry Point

Lab Order ID: **10079485**
Analysis: PBP
Date Received: 04/09/2025
Date Reported: 04/14/2025

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Reporting Limit (ppm)	Concentration (ppm)	Concentration (% by weight)
PC-17 / *10079485_0017*	**White Pressboard Walls**	0.0695	58	990	**0.099%**
PC-18 / *10079485_0018*	**White Wood Window Trim**	0.0998	40.	850	**0.085%**
PC-19 / *10079485_0019*	**Beige Concrete Walls**	0.0847	47	3300	**0.33%**

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Mark Doki (19)
Analyst

Approved Signatory

10079485

Client:	ECS Southeast, LLC	***Instructions:***	
Contact:	Braxton Dawson	*Use Column "B" for your contact info*	
Address:	6714 Netherlands Drive Wilmington, NC 28405		Lead Paint Chips
Mobile #:	910-899-1289	*To See an Example Click the bottom Example Tab.*	
Fax:	910-686-9666		
Email:	bdawson@ecslimited.com	***Enter samples between "<<" and ">>"***	
cc:		***Begin Samples with a "<< "above the first sample and end with a ">>" below the last sample.***	***Scientific Analytical Institute***
Project:	B153 - Post Office MCAS Cherry Point	*Only Enter your data on the first sheet "Sheet1"*	
Client Notes:			
Date Sampled:	4/4/2025 0:00	*Note: Data 1 and Data 2 are optional fields that do not show up on the official report, however they will be included in the electronic data returned to you to facilitate your reintegration of the report data.*	***4604 Dundas Drive*** ***Greensboro, NC 27407*** ***Phone: 336.292.3888*** ***Fax: 336.292.3313*** ***Email: lab@sailab.com***
P.O. #.	49-21422		
Date Submitted:	2/8/2025 0:00		
Analysis:	Paint Chips by Flame AA (PBP)		
TurnAroundTime:	3-day		

Sample Number	Notes	Sample Description	Data 2
<<			
PC-1		White Wood Siding	Exterior - Under Vinyl
PC-2		White Metal Columns	Exterior - Back Loading Dock
PC-3		White Wood Columns	Exterior - Front Porch
PC-4		Yellow Metal Railings	Exterior - Hydraulic Lift Components
PC-5		Grey Metal Double Doors	Exterior - Back Loading Dock
PC-6		Grey Metal Door Frames	Exterior - Back Loading Dock
PC-7		White Aluminum Jacketing	Exterior - Trim
PC-8		White Wood Door Casings	Exterior - Double Doors
PC-9		White Wood Fascia	Exterior - Back Loading Dock
PC-10		White Elastomeric Roof Coating	Exterior - Roof Membrane
PC-11		Brown/Red Metal Doors	USPS Side
PC-12		Brown Metal Door Frames	USPS Side
PC-13		Brown Wood Doors	MCAS Side
PC-14		Brown Wood Door Frames	MCAS Side
PC-15		White Wood Support Columns	USPS Side
PC-16		White Drywall Walls	USPS Side
PC-17		White Pressboard Walls	MCAS Side
PC-18		White Wood Window Trim	MCAS Side
PC-19		Beige Concrete Walls	USPS Interior Vault
>>			

Accepted ☑

Rejected ☐

Braxton B. Dawson

4/9 Received By 1030

Appendix V: Certifications/ Licenses

NC DEPARTMENT OF
HEALTH AND
HUMAN SERVICES

ROY COOPER • Governor
KODY H. KINSLEY • Secretary
MARK T. BENTON • Chief Deputy Secretary for Health
KELLY KIMPLE • Acting Director, Division of Public Health

January 6, 2025

Braxton B Dawson III
6714 Netherlands Drive
Wilmington, NC 28405

Dear Mr. Dawson:

Based upon the review of your accreditation application, the Health Hazards Control Unit (HHCU) has determined that you have fulfilled the requirements and are eligible for asbestos accreditation as a(n) INSPECTOR. Your assigned North Carolina accreditation number is 12830, which is reflected on your enclosed North Carolina Accreditation card. Please be sure to take this card with you to any asbestos work site where you are employed. The State requires that all persons conducting asbestos abatement or asbestos management activities be accredited and have their identification card on site.

Your North Carolina Inspector accreditation will expire on DECEMBER 31, 2025. It is NOT the policy of the HHCU to issue renewal notices. If you wish to continue working as a(n) Inspector after this expiration date, you must successfully complete the required training and submit a completed application to this office prior to December 31, 2025. If you should continue to perform asbestos management activities as a(n) Inspector without a valid North Carolina accreditation, you will be in violation of State regulations and may be cited for noncompliance.

Sincerely,

Ed Norman
gram Manager
lth Hazards Control Unit

Braxton B Dawson III
6714 Netherlands Drive
Wilmington, NC 28405

146698

North Carolina
Asbestos Accreditation

EXPIRATION			
12-31-2025			
DOB	SEX	HT	WT
04-06-1982	M	6'2"	250
CLASS		#	EXP
AIR MONITOR		80961	12-25
INSPECTOR		12830	12-25

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HAZARDOUS MATERIALS SURVEY

MCAS CHERRY POINT

BUILDING 3918
HAVELOCK, NORTH CAROLINA 28533

ECS PROJECT NO. 49:21422

FOR: MBF ARCHITECTS PA

DECEMBER 18, 2023

December 18, 2023

Mr. Bill Faulkenberry
MBF Architects PA
317-C Pollock Street
New Bern, North Carolina 28560
faulkenberry@mbfarchitects.com

ECS Project No. 49:21422

Reference: Hazardous Materials Survey, MCAS Cherry Point, Building 3918, Havelock, North Carolina

Dear Mr. Faulkenberry:

ECS Southeast, LLC (ECS) is pleased to provide MBF Architects PA with the results of the above referenced Hazardous Materials Survey performed in Building 3918 located at Marine Corp Air Station Cherry Point in Havelock, North Carolina. This report summarizes our observations, analytical results, findings, and recommendations related to the work performed. The work described in this report was performed by ECS in general accordance with the Scope of Services described in ECS Proposal Number 49:38795P and the terms and conditions of the agreement authorizing those services.

ECS appreciates this opportunity to provide MBF Architects PA with our services. If we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

ECS Southeast, LLC

Braxton B. Dawson
Environmental Project Manager
bdawson@ecslimited.com
910-686-9114

Tina M. Stewart, REM
Environmental Principal
tstewart@ecslimited.com
336-314-4691

EXECUTIVE SUMMARY

The property consists of Building 3918 located at Marine Corps Air Station (MCAS) Cherry Point in Havelock, North Carolina. Based on the information available, Building 3918 is an inline commercial building which contains restaurants, a dry cleaner, a pharmacy, a travel office, a safety store, general retail space, the Marine Corps Exchange (MCX) and the MCCS marketing offices. The Commissary, also located in Building 3918, was not included in this assessment. The project square footage is approximately 123,500 total square feet. ECS was contracted to perform a hazardous material survey including asbestos and lead paint sampling, as well as, a limited hazardous materials inventory.

The purpose of the survey was to determine if asbestos-containing materials (ACMs), lead-containing paint (LCP), universal waste, and liquid suspect PCB-containing equipment, are present on the subject property. The survey was performed within interior and exterior areas of the subject building, as well as, the roof but excluded the Commissary.

Asbestos Survey

On December 11, 2023, Mr. Braxton B. Dawson, a North Carolina accredited asbestos inspector, performed the asbestos assessment. Bulk samples were submitted to Scientific Analytical Institute, Inc. (SAI) in Greensboro, North Carolina for analysis via Polarized Light Microscopy (PLM) in accordance with the current EPA-600 methodology.

A total of 74 bulk samples from 30 homogeneous areas were submitted to the laboratory of which 97 layers were analyzed. Based on the laboratory analysis of the bulk samples collected during the survey, several of the materials were reported to contain asbestos above the regulatory limit of 1%.

The following materials were reported to be asbestos-containing:

- Brown VCT and black mastic in the IT room; and,
- Yellow/brown VCT and black mastic in select administrative and maketing offices; and
- Vibration dampeners in mechanical rooms (assumed).

Due to inaccessibility or the destructive means that asbestos sampling requires, unseen ACMs may remain within the building hidden behind inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, sub-grade sealants, flooring located below underlayments, areas behind exterior walls, pipe trenches, and subsurface utilities, etc.

If suspect materials are discovered during construction activities, they should be presumed to contain asbestos and be treated as ACMs or be sampled immediately upon discovery and prior to disturbance for asbestos content by an accredited or certified asbestos inspector in accordance with 29 Code of Federal Regulations (CFR) 1926.1101.

Lead Paint Survey

The lead paint assessment was conducted by collection of paint chip samples from suspect lead paint materials. The paint chip samples were submitted to a laboratory that participates in the American Industrial Hygiene Association (AIHA) Environmental Lead Proficiency Analytical Testing (ELPAT) Programs for analysis of lead concentration (percent by weight) using Flame Atomic Absorption Spectroscopy.

Based on the laboratory analysis of the paint chips collected during the survey, the following building components were reported as lead-containing paint (LCP) or assumed:

- White drywall columns in retail areas;
- Grey metal door frames in retail areas;
- Yellow steel columns and support beams throughout;
- Red steel sprinkler piping throughout;
- Tan CMU walls and ceilings in shoe store storage;
- Beige CMU walls in both janitor's closets;
- Grey metal handrails on warehouse mezannine;
- Blue CMU walls in marketing offices;
- Blue metal door frames in administrative offices; and,
- Brown metal door frames in break room/bathrooms.

Paint and surface coatings which contain detectable concentrations of lead are considered LCPs. Since OSHA has no specific action level for lead in paint, all paint on the site found to have a measurable concentration of lead should be assumed to be lead-containing. Work performed which may disturb LCP is regulated under OSHA as referenced under 29 CFR 1926.62.

Hazardous Waste

In addition to our survey for ACM and LCP, ECS surveyed the building for various materials classified as Hazardous Waste or Universal waste which may require special handling or disposal if disturbed or removed from the building. The materials are referenced below:

- Fluorescent lamps and corresponding ballasts; and,
- Lead-acid bateries in exit signage and alarm panels;

Recommendations regarding the removal and disposal of the ACM, LCP, and hazardous/universal waste identified by ECS can be found in Section 5.0 of this report.

The executive summary is an integral portion of this report, however, ECS recommends the report be read in its entirety.

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Appendix V: Certifications/Licenses

1.0 SITE DESCRIPTION

The property consists of Building 3918 located at Marine Corps Air Station (MCAS) in Cherry Point, North Carolina. Based on the information available, Building 3918 is an inline commercial building which includes restaurants, a dry cleaner, a pharmacy, a travel office, a safety store, general retail space, the Marine Corps Exchange (MCX) and the MCCS marketing offices. The Commissary, which is located in Building 3918, was not included in this assessment. The project square footage is approximately 123,500 total square feet. ECS was contracted to perform a hazardous material survey including asbestos and lead paint sampling, as well as, a limited hazardous materials inventory.

2.0 PURPOSE

The purpose of the Hazardous Materials Survey was to identify asbestos-containing materials (ACMs), lead-based paint (LBP), universal waste and suspect liquid poly-chlorinated biphenyl (PCB) containing equipment in fixtures which require special handling and/or disposal if disturbed during construction activities. The identification of ACMs require trained labor, regulated work practices, and special disposal. The identification of LBP or other lead hazards requires disclosure to contractors and monitoring of lead exposure. The identification of other regulated materials such as universal waste may require personal protective equipment, training, special handling, packaging, and disposal.

3.0 METHODOLOGY

ECS performed the authorized Scope of Services in general accordance with our proposal, standard industry practice(s) and methods specified by regulation(s) for the identification of ACMs, LBPs, and universal waste and suspect liquid PCB-containing equipment and fixtures.

3.1 Asbestos-Containing Materials

The asbestos survey was performed by Mr. Braxton B. Dawson (NC Asbestos Inspector No. 12830) on December 11, 2023. The survey consisted of observing the accessible areas of the building for the presence of suspect materials which may contain asbestos. The survey involved detecting both friable materials (materials which can be pulverized or reduced to a powder by hand pressure when dry) and non-friable materials (materials which pose a hazard when sawn, sanded, drilled or pulverized). Homogeneous materials (based on material type, color, texture, etc.) were identified in during the survey.

The EPA National Emissions Standard for Hazardous Air Pollutants (NESHAP) requires a survey for asbestos prior to renovation or demolition. Demolition is defined under NESHAP as the removal of a load-bearing structural member and renovation is an action which disturbs building materials. On the basis of requirements under NESHAP and North Carolina Asbestos Hazard Management Program (AHMP), administered by the Health Hazards Control Unit (HHCU), for renovation or demolition activities, ECS conducted a limited survey for potential ACM. The ACM survey was limited in that we did not conduct demolition such as jack/sledgehammering to expose potentially concealed materials. Samples were collected in general accordance with Environmental Protection Agency (EPA) Standard 40 CFR 763 Subpart E, Asbestos Hazard Emergency Response Act (AHERA) and Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1926.1101 Inspection Protocol.

In order to determine if the suspect materials observed during the visual survey contained asbestos, representative bulk samples were collected and placed in sealed packages. Samples were collected during the survey and submitted to SAI for analysis using the Environmental Protection Agency (EPA) recommended method of Polarized Light Microscopy (PLM) coupled with dispersion staining (Method No. EPA 600/R-93/116). SAI participates in the National Voluntary Laboratory Accreditation Program (NVLAP). Their NVLAP accreditation number is 200664-0. Several of the samples were layered and analyzed as multiple samples. EPA regulations require that multiple samples of each homogeneous area be collected for laboratory analysis. The material type, sample location, and analytical results of each bulk sample are also summarized in the attached Asbestos Bulk Analysis report in **Appendices**.

Samples were analyzed using "Positive Stop" methodology. If one sample of a homogeneous material is reported to contain asbestos, the remaining samples of that material are not analyzed. If one sample of a material from a homogeneous area is reported to contain greater than 1% asbestos, then by EPA definition, it is characterized as an ACM regardless of additional analysis.

During the survey, ECS attempted to identify suspect ACMs in readily accessible areas. However, due to the destructive means required to identify some materials, certain areas were deemed inaccessible (i.e. behind walls or sub grade materials) and were not surveyed for suspect ACMs.

3.2 Lead in Paint and Surface Coatings

ECS completed a lead paint screening within the building as part of our assessment activities. The collection of representative paint chip samples was performed throughout the building. Samples collected were containerized, labeled, and transported to SAI. Each of the paint chip samples were subsequently analyzed for the presence of lead reported in percent lead by weight via EPA Method SW 846, 7000B (Flame AAS). The chain-of-custody, which includes sample numbers and sample locations, is included in an Appendix of this report.

3.3 Universal Waste and Suspect Liquid PCB-Containing Equipment

ECS performed a visual survey of the interior and exterior of the building for the presence of universal waste materials and suspect liquid PCB-containing equipment. ECS entered the accessible areas to identify universal waste materials including batteries, stored pesticides, mercury-containing equipment and lamps. Additionally, lamp ballasts suspected of containing PCBs and lead-containing equipment were documented if observed.

No sampling or other characterization was performed as part of this scope of service. Additionally, ECS did not access any energized electrical equipment or other equipment/devices which were in use or that may pose a hazard to ECS personnel or building occupants.

4.0 RESULTS

The following is a summary of laboratory results, findings and observations.

4.1 Asbestos Sampling

In total, 74 bulk samples from 30 homogeneous areas were submitted to the laboratory of which 97 layers were analyzed.

An ACM is defined as any material containing more than one percent (>1%) asbestos as determined using the method specified in Appendix E, Subpart E, 40 CFR Part 763, Section 1, PLM. Materials are categorized by the U.S. EPA in the following categories:

- Friable ACMs are defined as any ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Non-friable ACMs are defined as any ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I non-friable ACM are listed as following: packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than one percent (>1%) asbestos.
- Category II non-friable ACM are listed as any material, excluding Category I non-friable ACM, containing more than one percent (>1%) asbestos.

Regulated Asbestos-Containing Materials (RACM) are friable ACM or non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or has crumbled, been pulverized, or reduced to powder in the course of renovation and/or demolition operations.

Scientific Analytical Institute, Inc. submitted a signed final laboratory report to ECS on December 14, 2023. Several of the bulk samples submitted for analysis were reported to contain asbestos in detectable concentrations. A complete list of the sampled materials submitted for analysis, sample locations, and photographs of representative building materials are located in the Appendices of this report.

Summary of Asbestos-Containing Materials Identified

Sample ID	Material Location	Material Description	Analytical Results	Category	Estimated Quantity
3-1,2	IT Room	Brown VCT and Black Mastic	Tile - 2% Chrysotile Mastic - 5% Chrysotile	Category I, Non-friable	500 Square Feet
22-1,2	Administrative and Marketing Offices	Yellow/ Brown VCT and Black Mastic	Tile - 2% Chrysotile Mastic - 5% Chrysotile	Category I, Non-friable	850 Square Feet

The above provided approximate quantities of the identified ACMs are for informational purposes only and should not be used for bidding purposes. ECS does not warranty or guarantee the estimated quantities provided. The contractors bidding on asbestos abatement work should visit the site prior to bidding to field verify the estimated quantities of ACMs and become familiar with the site conditions and address any technical or engineering considerations with respect to asbestos removal in their bids or estimates. Any similar materials located on the property should also be assumed to contain asbestos unless tested and the laboratory analysis indicates that asbestos is not present.

4.2 Suspect or Assumed Asbestos-Containing Materials

Due to the inaccessibility or the destructive means that asbestos sampling requires, additional suspect ACMs may remain within the building hidden behind inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, sub-grade sealants, flooring located below underlayments, areas behind exterior walls, pipe trenches, and subsurface utilities, etc. These areas were deemed inaccessible and were not assessed.

If these materials are discovered during construction activities, they should be presumed to contain asbestos and be treated as ACMs or be sampled immediately upon discovery and prior to disturbance for asbestos content by a certified asbestos inspector in accordance with 29 CFR 1926.1101.

Based upon our past experience in the identification of ACMs in similarly constructed buildings, the following additional suspect ACMs may also be located in inaccessible areas of the structure:

- Vibration dampeners in mechanical rooms.

4.3 Lead in Paint and Surface Coatings

Paint and surface coatings which contain detectable concentrations of lead considered "lead-containing paints" (LCP). Since OSHA has no specific action level for lead in paint, all paint on the site found to have a measurable concentration of lead should be assumed to be lead containing. Work performed which may disturb lead-containing paint is regulated under OSHA as referenced under 29 CFR 1926.62. Lead was detected in the paint chip samples analyzed. Lead-containing paints identified are summarized in the table below and photographs are located in the Appendix.

Summary Lead-Containing Paint

Sample ID	Location	Substrate	Component	Color	Result
L-1	MCX Retail	Drywall	Cloumns	White	Insufficient Sample (Assumed LCP, Presumed above 0.5%)
L-4	MCX Retail	Metal	Door Frames	Grey	Insufficient Sample (Assumed LCP, Presumed above 0.5%)
L-5	MCX Warehouse	Steel	Columns	Yellow	0.0056%

Sample ID	Location	Substrate	Component	Color	Result
L-6	MCX Warehouse	Steel	Sprinkler Pipes	Red	0.0032%
L-7	Shoe Store Storage	CMU	Walls and Ceilings	Tan	0.0049%
L-9	Janitor's Closets	CMU	Wallls	Beige	0.0080%
L-15	MCX Warehouse Mezannine	Metal	Handrails	Grey	Insufficient Sample (Assumed LCP, Presumed above 0.5%)
L-17	Mechanical rooms	Steel	Support Beams	Yellow	0.10%
L-18	Marketing Offices	CMU	Walls	Blue	Insufficient Sample (Assumed LCP, Presumed above 0.5%)
L-20	Administrati ve Offices	Metal	Door Frames	Blue	0.0085%
L-24	Break Room Bathr ooms	Metal	Door Frames	Brown	0.0086%

4.4 Universal Waste and Liquid Suspect PCB-Containing Equipment

The disposal of fixtures and equipment in buildings which contain various substances such as mercury or lead are regulated by local, state, and federal regulation. Collectively most mercury-containing materials and batteries which may contain lead, along with stored pesticides are classified as "Universal Waste". The disposal of lamp ballasts and electrical transformers which contain suspect PCB-containing oils is also regulated at the state and federal level.

4.4.1 Suspect Polychlorinated Biphenyl (PCB) Containing Ballasts and Equipment

PCBs are toxic coolants or lubricating oils used in some electrical transformers and capacitors, hydraulically-operated equipment, light ballasts, and other similar equipment.

As part of our survey, ECS attempted to identify potential liquid PCB-containing materials and equipment. At the time of the survey, ECS visually observed fluorescent light ballasts in accessible areas of the structure in an attempt to identify labeling indicating the presence/absence of PCB-containing fluids. Labeling was not accessible on the ballasts surveyed. At this time, it is recommended that all ballasts be assumed to be suspect PCB-containing.

4.4.2 Mercury-Containing Components

The EPA classifies mercury as both hazardous and toxic. The survey included observations for equipment which could contain mercury, such as thermostats, transformers, fluorescent lamps, and switch-containing devices.

As previously discussed, fluorescent lamps were observed. The fluorescent lamps may contain small quantities of mercury.

4.4.3 Lead-Acid Batteries

Lead-acid batteries located in emergency lamps, exit signs, alarm panels and associated with electrical components, etc. were observed or are assumed to be present. No evidence of leaking or damage was observed.

4.4.4 Pesticides

We did not observe pesticides. Bulk pesticides were reportedly stored off-site.

5.0 RECOMMENDATIONS AND REGULATORY REQUIREMENTS

Based on our understanding of the purpose of the Hazardous Materials Survey, the results of laboratory analysis, and our findings and observations, ECS presents the following recommendations.

5.1 Asbestos-Containing Materials

ECS recommends where a material type has been identified as asbestos-containing that other materials with similar color, texture, age and size throughout the building's interior and exterior be assumed to contain asbestos. Please refer to Section 4.1 for a complete list of building materials that were reported positive for asbestos and to Section 4.2 for materials that were assumed to contain asbestos.

If ACMs are to be removed, it is recommended that an industrial hygienist monitor the project. This involves collecting air samples from within and outside abatement work areas to monitor the asbestos abatement contractor's work practices over the course of the project. The industrial hygienist should evaluate if the asbestos abatement work is in accordance with project specifications, U.S. EPA regulation 40 CFR Part 61-National Emission Standards for Hazardous Air Pollutants Subpart M: National Emission Standard for Asbestos, and U.S. Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1926.1101 – Asbestos in Construction. The industrial hygienist should assess each work area to monitor the removal of ACMs. Only after the industrial hygienist has determined the identified ACMs have been removed should final clearance air samples be collected (if necessary).

Suspect ACMs not observed due to inaccessibility or not sampled due to the destructive means that sampling would require may also be encountered during construction activities. At the time of the survey, only limited destructive means were used to locate or sample suspect ACMs; therefore, additional suspect ACMs may remain within inaccessible areas that include, but are not limited to, [sub-grade walls, structural members, topping slabs, exterior areas, sub-grade sealants, flooring located below underlayments, vapor barriers, pipe trenches and other subsurface utilities, etc.] If additional suspect ACMs are uncovered which were not accessible during this survey, it is recommended that these materials either be assumed to contain asbestos or be sampled prior to disturbance upon discovery for asbestos content by an asbestos inspector in accordance with 29 CFR 1926.1101.

5.2 Lead in Paint and Surface Coatings

Based on the findings of the lead survey, detectable concentrations of lead were identified on some paints and surface coatings.

The presence of lead is a concern primarily when conditions exist where it may be inhaled or ingested. Regardless of the analytical results of a material, all painted and/or glazed surfaces may still contain concentrations of lead in the paint, which when disturbed, may generate lead dust greater than the Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter (ug/m3) as an 8-hour Time Weighted Average (TWA) established by the OSHA “Lead Exposure in Construction Rule (29 CFR 1926.62).”

The OSHA standard gives no guidance on acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected. Rather, OSHA defines airborne concentrations, and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during any removal/demolition process (as appropriate) to verify that actual personal exposures are below the (PEL of 50 $\mu g/m^3$ as an 8-hour TWA. Under OSHA requirements, the contractor performing renovation work will be required to conduct this monitoring and follow applicable requirements under 29 CFR 1926.62 if disturbing lead-containing paint.

5.3 Universal Waste and Liquid PCBs in Equipment

Fluorescent lamp ballasts manufactured prior to 1979 may contain small quantities of PCBs. Additionally, regardless of “PCB labeling,” ballasts produced between 1980 and 1991 may contain di-ethyl hexyl phthalate (DEHP) which is classified as a potential carcinogen by the EPA. Additionally, DEHP contamination on Superfund sites is common and responsible parties are subject to liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) should cleanup of DEHP be necessary.

The disposal of fixtures and equipment in buildings which contain various substances such as PCB, mercury or lead are regulated by local, state, and federal regulation. Collectively most PCB-containing materials and, equipment which may contain PCB's, are classified as "Universal Waste". The disposal of lamp ballasts and electrical transformers which contain suspect PCB-containing oils is also regulated at the state and federal level.

ECS recommends that all ballasts suspected to contain PCBs be properly recycled or disposed of in accordance with US EPA and regulations. In practice many ballasts lacking the "No-PCBs" label have been removed from buildings as part of routine maintenance; however, inspection of each ballast by the contractor performing removal is still recommended to ensure proper disposal into the proper waste stream.

ECS recommends that fluorescent lamp tubes/bulbs suspected to contain mercury be properly recycled or disposed of in accordance with EPA and North Carolina regulations. Recycling is the most environmental friendly means of disposal for these materials. Fluorescent lamps may be disposed as universal waste if they remain unbroken during removal. If bulbs are crushed or broken prior to disposal, they are classified as hazardous waste by the EPA.

The disposal of universal waste and lamp ballasts must be performed in a manner by which the individual wastes are segregated and disposed of properly as required by federal regulations. If any of these materials are observed to be leaking or otherwise damaged prior to disposal they must be disposed of as hazardous waste in accordance with EPA regulations. Handling, packaging, labeling, and disposal of hazardous materials should be performed in accordance with EPA and Department of Transportation regulations.

Generators of universal and hazardous waste must obtain an EPA Generator ID number in order to dispose of these materials.

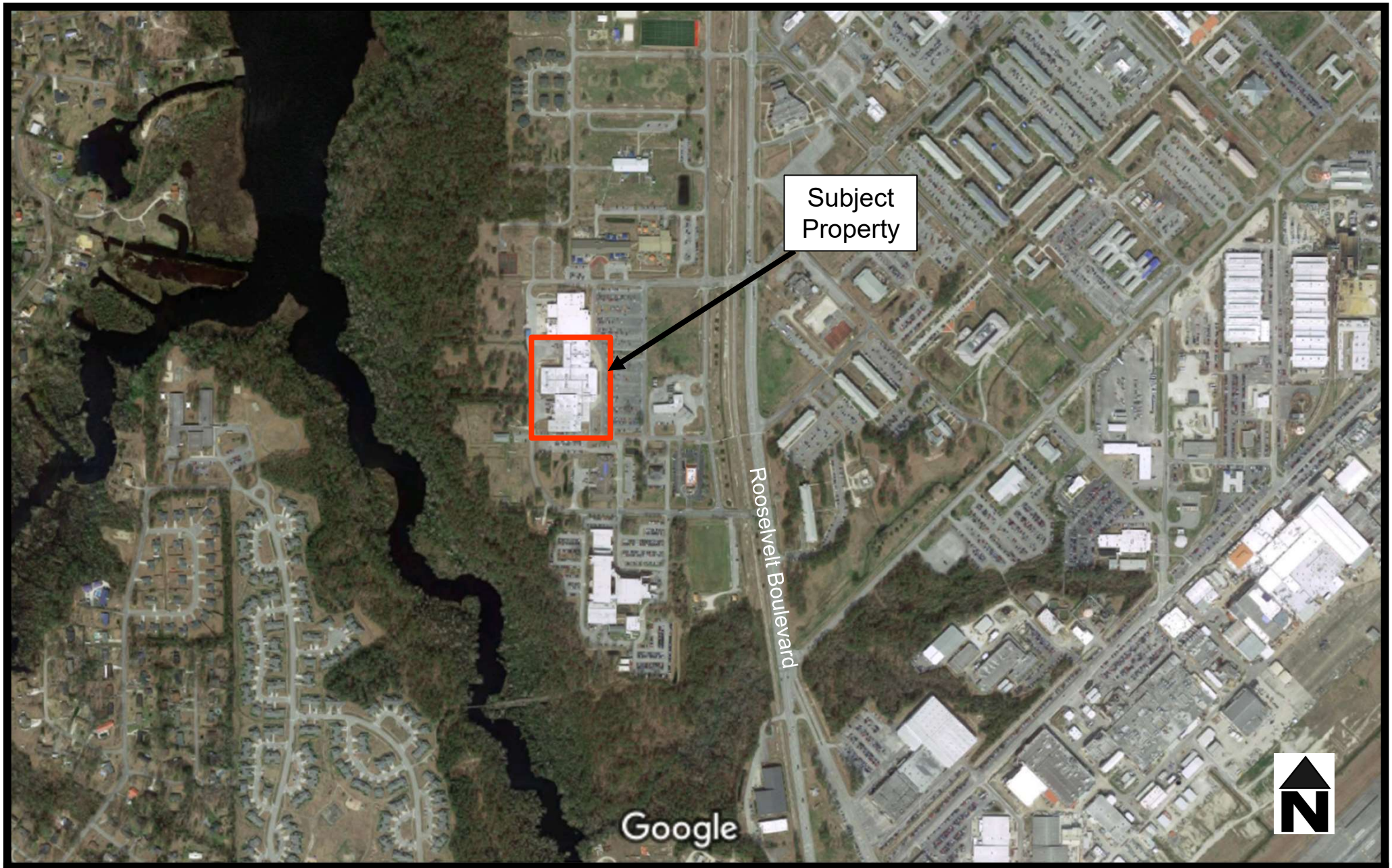
6.0 LIMITATIONS

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.

Our recommendations are in part based on federal, state, and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies, any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.

Appendix I: Figures



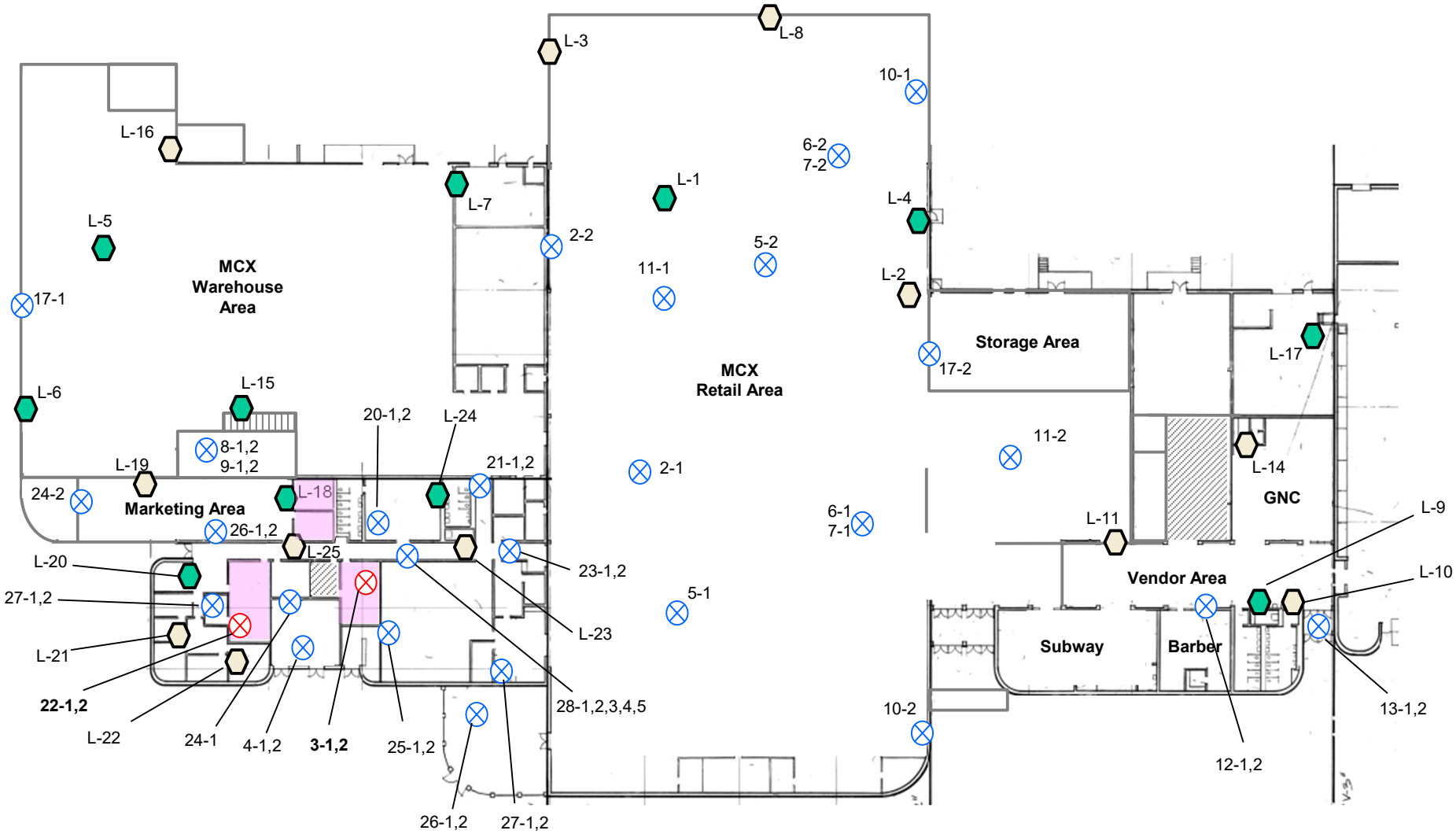
LEGEND

SURVEY AREA

NOT TO SCALE

FIGURE 1 – SITE LOCATION MAP

STUDY FOR REPAIRS & RECONFIGURATION - BUILDING 3918
MARINE CORPS AIR STATION, CHERRY POINT
HAVELOCK, NORTH CAROLINA
ECS PROJECT NO. 49-21422



Building 3918
Floor Plan

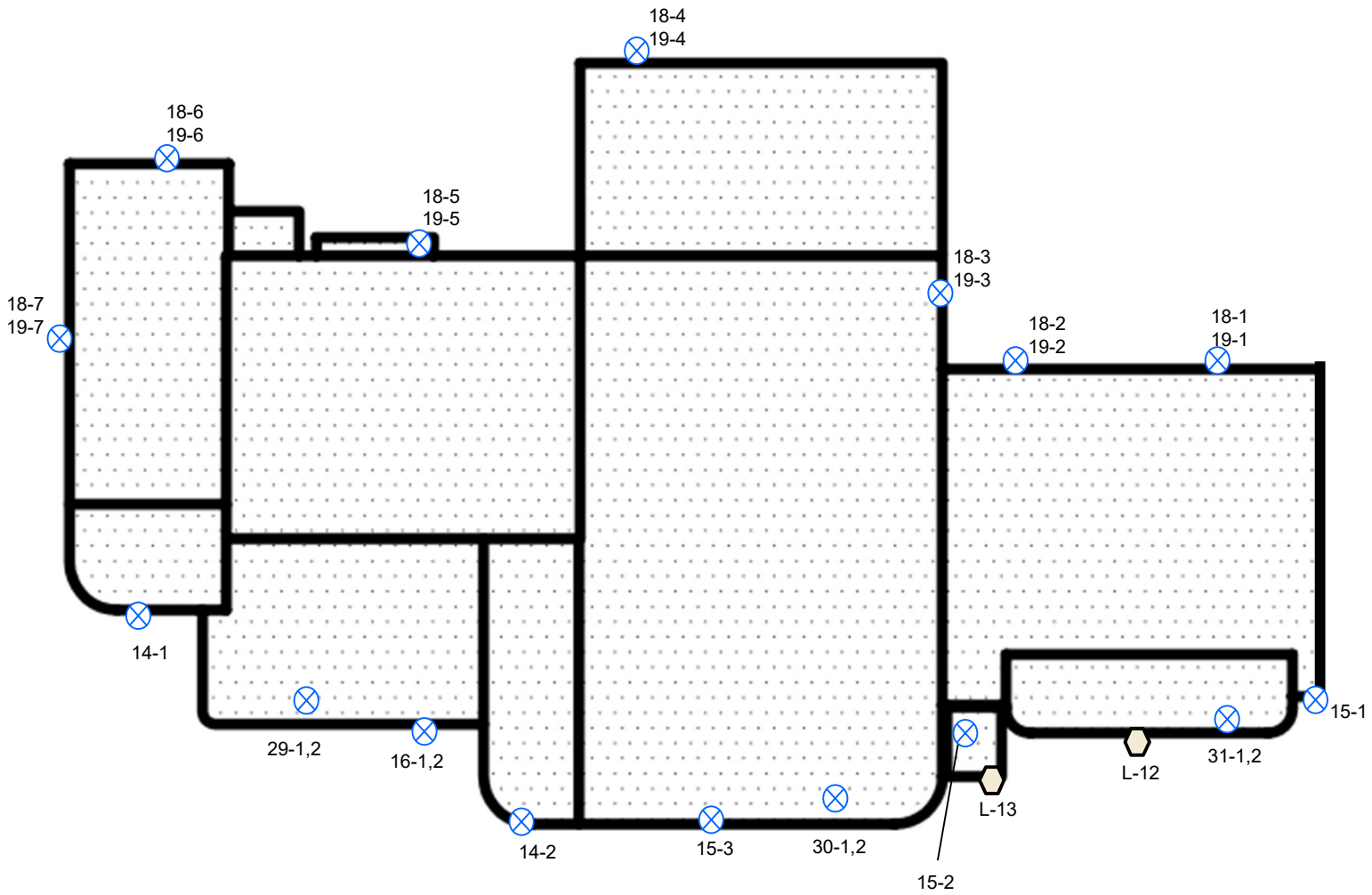
NOT TO SCALE

LEGEND

XX-XX	SAMPLE NUMBER		NO ACCESS
⊗	ASBESTOS NOT DETECTED		ACM FLOOR TILES & BLACK MASTIC
⊗	ASBESTOS DETECTED		
⬡	NO LEAD DETECTED	⬢	LEAD DETECTED

FIGURE 2 – ASBESTOS & LEAD SAMPLE LOCATION MAP

STUDY FOR REPAIRS & RECONFIGURATION - BUILDING 3918
MARINE CORPS AIR STATION, CHERRY POINT
HAVELOCK, NORTH CAROLINA
ECS PROJECT NO. 49-21422



Building 3918
Roof and Exterior

NOT TO SCALE

LEGEND

XX-XX	SAMPLE NUMBER		NO ACCESS
⊗	ASBESTOS NOT DETECTED		ACM FLOOR TILES & BLACK MASTIC
⊗	ASBESTOS DETECTED		
⬡	NO LEAD DETECTED	⬡	LEAD DETECTED

FIGURE 3 – ASBESTOS & LEAD SAMPLE LOCATION MAP

STUDY FOR REPAIRS & RECONFIGURATION - BUILDING 3918
MARINE CORPS AIR STATION, CHERRY POINT
HAVELOCK, NORTH CAROLINA
ECS PROJECT NO. 49-21422

Appendix II: Site Photographs

1 - View of the subject building.

2 - View of the marketeing/andinistrative wing.

3 - View of the back of the building.

4 - View of the roof.

5 - IMG 0893

6 - View of the vendor area hallway.

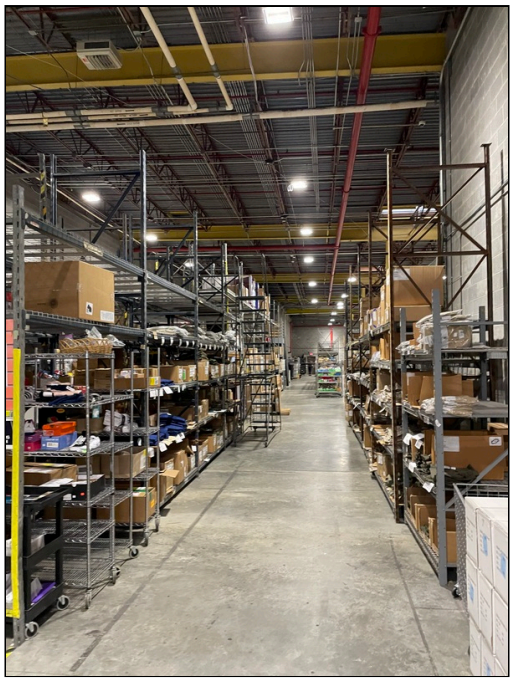
7 - View of the Subway restaurant.

8 - View of the GNC store.

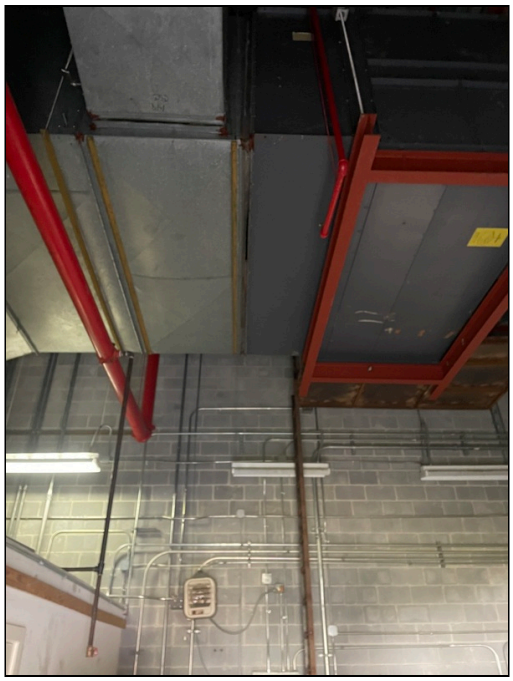
9 - View of the barbor shop.

10 - View of the empty vendor space (locked).

11 - View of the typical bathrooms.



12 - View of the typical MCX warehouse areas.



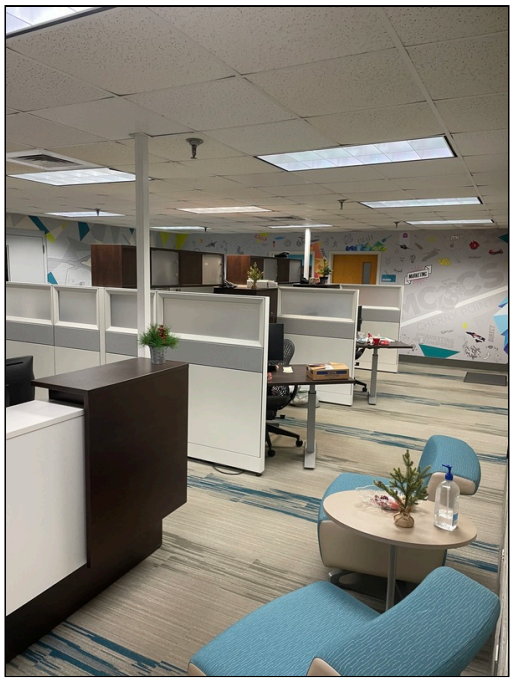
13 - View of the typical vibration dampeners (assume to be ACM).

14 - View of the shoe store storage room.

15 - View of the marketing hallway.

16 - View of the break room.

17 - View of the typical administrative offices.



18 - View of the marketing offices.

19 - View of the brown VCT with black mastic under carpet in the IT room.

Appendix III: Asbestos Bulk Sample Results

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: Building 3918

Lab Order ID: **10038909**
Analysis: PLM
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
2-1	Drywall + joint compound (composite)	**None Detected**	**10% Cellulose**	**90% Other**	White, Gray Non-Fibrous Heterogeneous
10038909_0001	*drywall:none detect;joint compound:none detect*				Dissolved
2-2	Drywall + joint compound (composite)	**None Detected**	**10% Cellulose**	**90% Other**	White, Gray Non-Fibrous Heterogeneous
10038909_0002	*drywall:none detect;joint compound:none detect*				Dissolved
3-1 - A	12" brown VCT + mastic (black)	**2% Chrysotile**		**98% Other**	Brown Non-Fibrous Heterogeneous
10038909_0003	*tile*				Dissolved
3-1 - B	12" brown VCT + mastic (black)	**5% Chrysotile**		**95% Other**	Black Non-Fibrous Homogeneous
10038909_0075	*mastic*				Dissolved
3-2 - A	12" brown VCT + mastic (black)	**Not Analyzed**			
10038909_0004	*tile*				
3-2 - B	12" brown VCT + mastic (black)	**Not Analyzed**			
10038909_0076	*mastic*				
4-1	2x4 fissured ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0005					Teased
4-2	2x4 fissured ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0006					Teased

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Eloisa Blake (97)
Analyst

Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: Building 3918

Lab Order ID: **10038909**
Analysis: PLM
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
5-1	Carpet mastic	**None Detected**		**100% Other**	Beige Non-Fibrous Heterogeneous
10038909_0007					Dissolved
5-2	Carpet mastic	**None Detected**		**100% Other**	Beige Non-Fibrous Heterogeneous
10038909_0008					Dissolved
6-1 - A	12" light beige VCT + mastic	**None Detected**		**100% Other**	Beige Non-Fibrous Heterogeneous
10038909_0009	*tile*				Dissolved
6-1 - B	12" light beige VCT + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0077	*mastic*				Dissolved
6-2 - A	12" light beige VCT + mastic	**None Detected**		**100% Other**	Beige Non-Fibrous Heterogeneous
10038909_0010	*tile*				Dissolved
6-2 - B	12" light beige VCT + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0078	*mastic*				Dissolved
7-1 - A	12" white VCT + mastic	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0011	*tile*				Dissolved
7-1 - B	12" white VCT + mastic	**None Detected**		**100% Other**	Yellow, Gray Non-Fibrous Heterogeneous
10038909_0079	*mastic/leveling compound*				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogenous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Eloisa Blake (97)
Analyst

Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: Building 3918

Lab Order ID: **10038909**
Analysis: PLM
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
7-2 - A	12" white VCT + mastic	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0012	*tile*				Dissolved
7-2 - B	12" white VCT + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0080	*mastic*				Dissolved
8-1 - A	Green 12" VCT + mastic	**None Detected**		**100% Other**	Green Non-Fibrous Heterogeneous
10038909_0013	*tile*				Dissolved
8-1 - B	Green 12" VCT + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0081	*mastic*				Dissolved
8-2 - A	Green 12" VCT + mastic	**None Detected**		**100% Other**	Green Non-Fibrous Heterogeneous
10038909_0014	*tile*				Dissolved
8-2 - B	Green 12" VCT + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0082	*mastic*				Dissolved
9-1	2x2 pinhole ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0015					Teased
9-2	2x2 pinhole ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0016					Teased

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Eloisa Blake (97)
Analyst

Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and
40 CFR, Part 763, Subpart E, App.E

NVLAP LAB CODE 200664-0

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project: Building 3918

Lab Order ID: **10038909**
Analysis: PLM
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
10-1 - A	Grey cove base + mastic	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10038909_0017	*cove base*				Dissolved
10-1 - B	Grey cove base + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0083	*mastic*				Dissolved
10-2 - A	Grey cove base + mastic	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10038909_0018	*cove base*				Dissolved
10-2 - B	Grey cove base + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0084	*mastic*				Dissolved
11-1	2x2 texture ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0019					Teased
11-2	2x2 texture ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0020					Teased
12-1	Drywall + joint compound (composite)	**None Detected**	**10% Cellulose**	**90% Other**	Gray, White Non-Fibrous Heterogeneous
10038909_0021	*drywall:none detect;joint compound:none detect*				Dissolved
12-2	Drywall + joint compound (composite)	**None Detected**	**10% Cellulose**	**90% Other**	Gray, White Non-Fibrous Heterogeneous
10038909_0022	*drywall:none detect;joint compound:none detect*				Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
13-1 - A	Tan VCT 12" + mastic	**None Detected**		**100% Other**	Tan Non-Fibrous Heterogeneous
10038909_0023	*tile*				Dissolved
13-1 - B	Tan VCT 12" + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0085	*mastic*				Dissolved
13-2 - A	Tan VCT 12" + mastic	**None Detected**		**100% Other**	Tan Non-Fibrous Heterogeneous
10038909_0024	*tile*				Dissolved
13-2 - B	Tan VCT 12" + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0086	*mastic*				Dissolved
14-1	Masonry control joint caulk	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10038909_0025					Dissolved
14-2	Masonry control joint caulk	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10038909_0026					Dissolved
15-1	Textured soffits	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0027					Dissolved
15-2	Textured soffits	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0028					Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
15-3	Textured soffits	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0029					Dissolved
16-1	Grey caulk	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10038909_0030					Dissolved
16-2	Grey caulk	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10038909_0031					Dissolved
17-1	Tan caulk	**None Detected**		**100% Other**	Tan Non-Fibrous Homogeneous
10038909_0032					Dissolved
17-2	Tan caulk	**None Detected**		**100% Other**	Tan Non-Fibrous Homogeneous
10038909_0033					Dissolved
18-1	CMU surfacing material	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0034					Dissolved
18-2	CMU surfacing material	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0035					Dissolved
18-3	CMU surfacing material	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0036					Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
18-4	CMU surfacing material	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0037					Dissolved
18-5	CMU surfacing material	**None Detected**		**100% Other**	Gray, Tan Non-Fibrous Heterogeneous
10038909_0038					Dissolved
18-6	CMU surfacing material	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0039					Dissolved
18-7	CMU surfacing material	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0040					Dissolved
19-1	EIFS plaster	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0041					Dissolved
19-2	EIFS plaster	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0042					Dissolved
19-3	EIFS plaster	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0043					Dissolved
19-4	EIFS plaster	**None Detected**		**100% Other**	Gray, Tan Non-Fibrous Heterogeneous
10038909_0044					Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
19-5	EIFS plaster	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0045					Dissolved
19-6	EIFS plaster	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0046					Dissolved
19-7	EIFS plaster	**None Detected**		**100% Other**	Tan, Gray Non-Fibrous Heterogeneous
10038909_0047					Dissolved
20-1	2x4 pinhole ceiling tiles	**None Detected**	**40% Cellulose** **40% Fiber Glass**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0048					Teased
20-2	2x4 pinhole ceiling tiles	**None Detected**	**40% Fiber Glass** **40% Cellulose**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0049					Teased
21-1 - A	Dark grey cove base + mastic	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10038909_0050	*cove base*				Dissolved
21-1 - B	Dark grey cove base + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0087	*mastic*				Dissolved
21-2 - A	Dark grey cove base + mastic	**None Detected**		**100% Other**	Gray Non-Fibrous Homogeneous
10038909_0051	*cove base*				Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
21-2 - B	Dark grey cove base + mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0088	*mastic*				Dissolved
22-1 - A	Yellow/brown VCT + black mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0052	*mastic 1*				Dissolved
22-1 - B	Yellow/brown VCT + black mastic	**2% Chrysotile**		**98% Other**	Brown Non-Fibrous Heterogeneous
10038909_0089	*tile*				Dissolved
22-1 - C	Yellow/brown VCT + black mastic	**5% Chrysotile**		**95% Other**	Black Non-Fibrous Homogeneous
10038909_0090	*mastic 2*				Dissolved
22-2 - A	Yellow/brown VCT + black mastic	**None Detected**		**100% Other**	Yellow Non-Fibrous Homogeneous
10038909_0053	*mastic 1*				Dissolved
22-2 - B	Yellow/brown VCT + black mastic	**Not Analyzed**			
10038909_0091	*tile*				
22-2 - C	Yellow/brown VCT + black mastic	**Not Analyzed**			
10038909_0092	*mastic 2*				
33-1 - A	White 12" VCT + mastic	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0054	*tile*				Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
33-1 - B	White 12" VCT + mastic	**None Detected**		**100% Other**	Yellow, Black Non-Fibrous Homogeneous
10038909_0093	*mastic*				Dissolved
33-2 - A	White 12" VCT + mastic	**None Detected**		**100% Other**	White Non-Fibrous Heterogeneous
10038909_0055	*tile*				Dissolved
33-2 - B	White 12" VCT + mastic	**None Detected**		**100% Other**	Yellow, Black Non-Fibrous Homogeneous
10038909_0094	*mastic*				Dissolved
24-1	Drywall + joint compound (composite)	**None Detected**	**10% Cellulose**	**90% Other**	White Non-Fibrous Heterogeneous
10038909_0056	*drywall:none detect;joint compound:none detect*				Dissolved
24-2	Drywall + joint compound (composite)	**None Detected**	**10% Cellulose**	**90% Other**	White Non-Fibrous Heterogeneous
10038909_0057	*drywall:none detect;joint compound:none detect*				Dissolved
25-1 - A	White cove base + mastic	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10038909_0058	*cove base*				Dissolved
25-1 - B	White cove base + mastic	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10038909_0095	*mastic*				Dissolved
25-2	White cove base + mastic	**None Detected**		**100% Other**	White Non-Fibrous Homogeneous
10038909_0059	*cove base only*				Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
26-1	2x2 fissured ceiling tiles	**None Detected**	**40% Fiber Glass** **40% Cellulose**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0060					Teased
26-2	2x2 fissured ceiling tiles	**None Detected**	**40% Fiber Glass** **40% Cellulose**	**20% Other**	Gray Fibrous Heterogeneous
10038909_0061					Teased
27-1 - A	Black cove base + mastic	**None Detected**		**100% Other**	Black Non-Fibrous Homogeneous
10038909_0062	*cove base*				Dissolved
27-1 - B	Black cove base + mastic	**None Detected**		**100% Other**	Cream Non-Fibrous Homogeneous
10038909_0096	*mastic*				Dissolved
27-2 - A	Black cove base + mastic	**None Detected**		**100% Other**	Black Non-Fibrous Homogeneous
10038909_0063	*cove base*				Dissolved
27-2 - B	Black cove base + mastic	**None Detected**		**100% Other**	Cream Non-Fibrous Homogeneous
10038909_0097	*mastic*				Dissolved
28-1	CMU surfacing material	**None Detected**		**100% Other**	Beige, White Non-Fibrous Heterogeneous
10038909_0064					Dissolved
28-2	CMU surfacing material	**None Detected**		**100% Other**	White, Beige Non-Fibrous Heterogeneous
10038909_0065					Dissolved

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Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
28-3	CMU surfacing material	**None Detected**		**100% Other**	White, Beige Non-Fibrous Heterogeneous
10038909_0066					Dissolved
28-4	CMU surfacing material	**None Detected**		**100% Other**	White, Beige Non-Fibrous Heterogeneous
10038909_0067					Dissolved
25-5	CMU surfacing material	**None Detected**		**100% Other**	White, Beige Non-Fibrous Heterogeneous
10038909_0068					Dissolved
29-1	Built-up roof	**None Detected**	**10% Cellulose**	**90% Other**	Black Non-Fibrous Heterogeneous
10038909_0069					Dissolved
29-2	Built-up roof	**None Detected**	**10% Fiber Glass**	**90% Other**	Black Non-Fibrous Heterogeneous
10038909_0070					Dissolved
30-1	Built-up roof	**None Detected**	**15% Synthetic Fibers**	**85% Other**	Black Non-Fibrous Heterogeneous
10038909_0071					Dissolved
30-2	Built-up roof	**None Detected**	**15% Synthetic Fibers**	**85% Other**	Black Non-Fibrous Heterogeneous
10038909_0072					Dissolved
31-1	Built-up roof	**None Detected**	**10% Cellulose**	**90% Other**	Black Non-Fibrous Heterogeneous
10038909_0073					Dissolved

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31-2	Built-up roof	**None Detected**	**10% Fiber Glass**	**90% Other**	Black Non-Fibrous Heterogeneous
10038909_0074					Dissolved

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Lab Order ID: 10038909
Client Code: _____

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Billing/Invoice Information	Turn Around Times	
Company:	90 Min. ☐	48 Hours ☒
Contact:	3 Hours ☐	72 Hours ☐
Address:	6 Hours ☐	96 Hours ☐
	12 Hours ☐	120 Hours ☐
	24 Hours ☐	144+Hours ☐

Asbestos Test Types	
PLM EPA 600/R-93/116 (PLM)	☒
Positive stop	☒
PLM Point Count 400 (PT4)	☐
PLM Point Count 1000 (PTM)	☐
PCM NIOSH 7400-A Rules (PCM)	☐
B Rules (PCB) ☐ TWA (PTA)	☐
TEM AHERA (AHE)	☐
TEM Level II (LII)	☐
TEM NIOSH 7402 (TNI)	☐
TEM Bulk Qualitative (TBL)	☐
TEM Bulk Chatfield (TBS)	☐
TEM Bulk Quantitative (TBQ)	☐
TEM Wipe ASTM D6480-05	☐
TEM Microvac ASTM D5755-02	☐
TEM Water EPA 100.2 (TW1)	☐
Other: _____	☐

PO Number: 49-21422
Project Name/Number: Building 3918

Sample ID #		Volume/Area	Comments
2-1,2	Drywall + Joint Compound (composite)		Retail
3-1,2	12" Brown VCT + Mastic (black)		
4-1,2	2x4 fissured Ceiling Tiles		
5-1,2	Carpet Mastic		
6-1,2	12" light Beige VCT + Mastic		Retail - Primary
7-1,2	12" white VCT + Mastic		"
8-1,2	Green 12" VCT + Mastic		Visuals Office
9-1,2	2x2 Pinhole Ceiling Tiles		
10-1,2	Grey Cove Base + Mastic		Retail
11-1,2	2x2 Texture Ceiling Tiles		
12-1,2	Drywall + Joint Compound (composite)		Vendor Areas

Total # of Samples _____

Relinquished by	Date/Time	Received by	Date/Time
[signature]	12/11/23 5:00pm	[signature]	12/12 10:20

A-F-017 EXP: 12-1-13

Accepted ☐

Rejected ☐

Scientific Analytical Institute
4604 Dundas Dr. Greensboro, NC 27407
Phone: 336.292.3888 Fax: 336.292.3313
www.sailab.com lab@sailab.com

Lab Use Only
Lab Order ID: _____
Client Code: _____

Sample ID #	Description/Location	Volume/Area	Comments
13-1,2	Tan VCT 12" + Mastic		
14-1,2	Masonry Control Joint Caulk		Brick Facade
15-1,2,3	Textured Soffits		
16-1,2	Grey Caulk		
17-1,2	Tan Caulk		
18-1,2,3,4,5,6,7	CMU Surfacing Material		Exterior
19-1,2,3,4,5,6,7	EIFS Plaster		Exterior
20-1,2	2x4 Pinhole Ceiling Tiles		
21-1,2	Dark grey Cove Base + Mastic		
22-1,2	Yellow/Brown VCT + Black Mastic		
33-1,2	White 12" VCT + Mastic		
24-1,2	Drywall + Joint Compound (composite)		Marketing
25-1,2	White Cove Base + Mastic		
26-1,2	2x2 Fissured Ceiling Tiles		
27-1,2	black Cove Base + Mastic		
28-1,2,3,4,5	CMU Surfacing Material		
29-1,2	Built-up Roof		Marketing
30-1,2	Built-up Roof		Retail
31-1,2	Built-up Roof		Vendor Area

A-F-017 EXP: 12-1-13

Appendix IV: Lead Laboratory Analytical Results

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project:

Lab Order ID: **10038920**
Analysis: PBP
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Concentration (ppm)	Concentration (% by weight)
L-1 / *10038920_0001*	**White drywall columns**	0.0170	Insufficient Sample	
L-2 / *10038920_0002*	**Gray wood door frames**	0.0253	<63	**<0.0063%**
L-3 / *10038920_0003*	**White CMU walls**	0.0976	<41	**<0.0041%**
L-4 / *10038920_0004*	**Gray metal door frames**	0.0113	Insufficient Sample	
L-5 / *10038920_0005*	**Yellow mastic columns**	0.0294	56	**0.0056%**
L-6 / *10038920_0006*	**Red metal sprinkler piping**	0.1270	32	**0.0032%**
L-7 / *10038920_0007*	**Tan CMU walls**	0.1172	49	**0.0049%**
L-8 / *10038920_0008*	**Blue CMU walls**	0.1296	<31	**<0.0031%**

Disclaimer: Unless otherwise noted blank sample correction was not performed on analytical results. Scientific Analytical Institute participates in the AIHA ELPAT program. ELPAT Laboratory ID: 173190. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. Analytical uncertainty available upon request. The quality control samples run with the samples in this report have passed all EPA required specifications unless otherwise noted. RL: (Report Limit for an undiluted 50ml sample is 4µg Total Pb).

Matthew Caffey (25)
Analyst

Approved Signatory

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project:

Lab Order ID: **10038920**
Analysis: PBP
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Concentration (ppm)	Concentration (% by weight)
L-9 / *10038920_0009*	**Beige CMU walls**	0.0682	80.	**0.0080%**
L-10 / *10038920_0010*	**Gray metal door frames**	0.0858	<47	**<0.0047%**
L-11 / *10038920_0011*	**White drywall walls**	0.0688	<58	**<0.0058%**
L-12 / *10038920_0012*	**Dark gray metal door**	0.0776	<52	**<0.0052%**
L-13 / *10038920_0013*	**White metal fascia**	0.0835	<48	**<0.0048%**
L-14 / *10038920_0014*	**Grey wood door**	0.0237	<68	**<0.0068%**
L-15 / *10038920_0015*	**Grey mezannine rails (metal)**	0.0168	Insufficient Sample	
L-16 / *10038920_0016*	**Brown metal door frames**	0.0549	<73	**<0.0073%**

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Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project:

Lab Order ID: **10038920**
Analysis: PBP
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Concentration (ppm)	Concentration (% by weight)
L-17 / *10038920_0017*	**Yellow metal H-Beams**	0.1097	1000	**0.10%**
L-18 / *10038920_0018*	**Blue CMU wall**	0.0128	Insufficient Sample	
L-19 / *10038920_0019*	**White metal door frame**	0.0269	<59	**<0.0059%**
L-20 / *10038920_0020*	**Blue metal door frame**	0.0349	85	**0.0085%**
L-21 / *10038920_0021*	**Yellow drywall walls**	0.0393	<41	**<0.0041%**
L-22 / *10038920_0022*	**White exterior door frames**	0.0220	<73	**<0.0073%**
L-23 / *10038920_0023*	**Tan CMU walls**	0.0735	<54	**<0.0054%**
L-24 / *10038920_0024*	**Brown metal door frames**	0.0544	86	**0.0086%**

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Matthew Caffey (25)
Analyst

Approved Signatory

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3050B/6010C/7000B

Customer: ECS Southeast, LLP
6714 Netherlands Dr
Wilmington, NC 28405

Attn: Braxton Dawson

Project:

Lab Order ID: **10038920**
Analysis: PBP
Date Received: 12/12/2023
Date Reported: 12/14/2023

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Mass (g)	Concentration (ppm)	Concentration (% by weight)
L-25	**Grey metal door frames**	0.0634	<63	**<0.0063%**
10038920_0025				

Disclaimer: Unless otherwise noted blank sample correction was not performed on analytical results. Scientific Analytical Institute participates in the AIHA ELPAT program. ELPAT Laboratory ID: 173190. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. Analytical uncertainty available upon request. The quality control samples run with the samples in this report have passed all EPA required specifications unless otherwise noted. RL: (Report Limit for an undiluted 50ml sample is 4µg Total Pb).

Matthew Caffey (25)
Analyst

Approved Signatory

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Phone: 336.292.3888 Fax: 336.292.3313
www.sailab.com lab@sailab.com

Lab Use Only
Lab Order ID: 10038420
Client Code: _____

Contact Information

Company Name: ECS Southeast, LLP
Address: 6714 Netherlands Drive
Wilmington, NC 28405
Contact: Braxton Dawson
Phone ☒: 910-899-1289
Fax ☐:
Email ☒: bdawson@ecslimited.com
PO Number:
Project Name/Number:

Billing/Invoice Information

Company: Same
Address:
Contact:
Phone ☐:
Fax ☐:
Email ☐:

Lead Test Types

Paint Chips by Flame AA (PBP) ☒	Soil by Flame AA (PBS) ☐	Other ☐
Wipe by Flame AA (PBW) ☐	Air by Flame AA (PBA) ☐	

Turn Around Times

3 Hours	☐	72 Hours	☐
6 Hours	☐	96 Hours	☐
12 Hours	☐	120 Hours	☐
24 Hours	☐	144+ Hours	☐
48 Hours	☒		

Sample ID #	Description/Location	Volume/Area	Comments
L-1	White Drywall Columns		Retail
L-2	Gray Wood Door Frames		"
L-3	White CMU Walls		"
L-4	Gray Metal Door Frames		"
L-5	Yellow Metal Columns		Retail Storage
L-6	Red Metal Sprinkler Piping		"
L-7	Tan CMU Walls		
L-8	Blue CMU Walls		
L-9	Beige CMU Walls		Vendor JC
L-10	Gray Metal Door Frames		Vendor Hallway
L-11	White Drywall Walls		"
L-12	Dark Gray Metal Door		Barbor Shop
L-13	White Metal Fascia		
L-14	Grey Wood Door		GNC
L-15	Grey Mezannine Rails (Metal)		Retail Storage
L-16	Brown Metal Door Frames		
L-17	Yellow Metal H-Beams		Mechanical
L-18	Blue CMU Wall		Marketing
L-19	White Metal Door Frame		"
L-20	Blue Metal Door Frame		Office

Accepted

Total Number of Samples 25

Relinquished by	Date/Time	Received by	Date/Time
	12/11/23 5:00pm		12/12 1030

Scientific Analytical Institute
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Phone: 336.292.3888 Fax: 336.292.3313
www.sailab.com lab@sailab.com

Lab Use Only
Lab Order ID: 10038920
Client Code:

Sample ID #	Description/Location	Volume/Area	Comments
L-21	Yellow Drywall Walls		
L-22	White Exterior Door Frames		
L-23	Tan CMU Walls		Marketing JC
L-24	Brown Metal Door Frames		
L-25	Grey Metal Door Frames		

A-F-017 EXP: 12-1-13

Appendix V: Certifications/ Licenses

Braxton B Dawson III
6213 Dominion Dr
Wilmington, NC 28403

139663

North Carolina
Asbestos Accreditation

EXPIRATION			
02-29-2024			
DOB	SEX	HT	WT
04-06-1982	M	6'2"	295
CLASS		#	EXP
AIR MONITOR		80961	02-24
INSPECTOR		12830	02-24

SECTION 01 91 00.15

BUILDING COMMISSIONING
05/23, CHG 2: 11/23

PART 1 GENERAL

Building Commissioning is a systematic, quality-focused process for enhancing the delivery of a project that focuses on verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the project requirements. The purpose is to reduce the cost and performance risks associated with delivering facilities projects, and to increase value to owners, occupants, and users.

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 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 202	(2018) Commissioning Process for Buildings and Systems

ASSOCIATED AIR BALANCE COUNCIL (AABC)

ACG Commissioning Guideline	(2005) Commissioning Guideline

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB S1110	(2019) Whole Building Technical Commissioning of New Construction; 2nd Edition

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

ANSI/SMACNA 014	(2013) HVAC Systems Commissioning Manual, 2nd Edition

1.2 DEFINITIONS

Commissioning Process (Cx) - a quality-focused process for enhancing the delivery of a project. Refer to ASHRAE 202 for a comprehensive description of the commissioning process.

Commissioning Provider (CxC) - The entity who leads, plans, and coordinates the Commissioning Team. The terms Commissioning Provider, Commissioning Firm, Lead Commissioning Specialist, Commissioning Specialist, and Commissioning Authority (CA or CxA) when used by sustainable Third Party Certification (TPC) programs, are interchangeable.

Commissioning Authority – The Government retains the authority for oversight and assurance of the entire commissioning process, and final approval of all commissioning deliverables.

Government Acceptance Testing Representatives - Government Acceptance Testing Representatives perform the inherently Governmental function of technical oversight and quality assurance for critical systems, and is distinctly separate from the commissioning process. Government Acceptance Testing Representatives witness final testing of critical systems and report systems' acceptance to the Contracting Officer's Representative (COR). Submittals to be surveilled and approved by Government Acceptance Testing Representatives are identified in Section 01 33 00 SUBMITTAL PROCEDURES. Testing required to be witnessed by Government Acceptance Testing Representatives are identified in system level sections.

1.3 COMMUNICATION WITH THE GOVERNMENT

The Lead Commissioning Specialist (CxC) must submit all plans, schedules, reports, and documentation directly to the COR concurrent with submission to the QC Manager.

The Lead Commissioning Specialist must have direct communication with the COR regarding all elements of the commissioning process; however, the Government has no direct contract authority with the Lead Commissioning Specialist.

1.4 COMMUNICATION WITH GOVERNMENT ACCEPTANCE TESTING REPRESENTATIVES

The QC Manager must communicate directly with the Government Acceptance Testing Representatives and COR regarding Government acceptance testing activities. Inform the COR when systems are ready for testing to be witnessed by Government Acceptance Testing Representatives, and allow access to the construction site and system(s) to be tested.

1.5 SYSTEMS TO BE COMMISSIONED

Coordinate commissioning and QC activities for the following systems, equipment, and associated controls. System-specific requirements are located in the associated specification sections. Commission the following systems, equipment, and associated controls in accordance with this section and the inspection, testing, and QC requirements of their respective sections:

Heating, ventilating, air-conditioning, and refrigeration systems (mechanical and passive) and associated controls (HVAC)

Lighting systems: interior and exterior, automatic and manual daylighting controls, occupancy sensing devices, automatic shut-off controls, time switching, and other lighting control devices, and dimming systems

1.6 RELATED SECTIONS

Refer to the following technical sections for additional commissioning requirements for respective systems:

Section 23 08 00 COMMISSIONING OF MECHANICAL SYSTEMS

1.7 COMMISSIONING TEAM

The Commissioning team will include, but is not limited to the following team members.

Ensure all Construction Activities for systems to be commissioned are coordinated with the appropriate commissioning team members.

a. Commissioning Provider

b. QC Manager (QCM)

c. Sub-Contractor Representatives for each trade responsible for construction/installation of systems to be commissioned

d. Construction Manager (CM)

e. Technical Commissioning Specialists for each system to be commissioned

f. TAB Representative

g. Equipment manufacturer representatives

h. Government Contracting Officer

i. Government Representatives

j. Installation Maintenance Representative

k. Facility End User

m. Government Acceptance Testing Representatives

1.8 PROJECT SCHEDULE

Include the following tasks in the project schedule required by Section 01 32 16.00 20 SMALL PROJECT CONSTRUCTION PROGRESS SCHEDULES and in the construction phase commissioning plan. Ensure sufficient time is scheduled to complete each item. The order of items listed below is not intended to imply a specified sequence:

a. Submission and approval of the Commissioning Firm Qualifications

c. Submission and approval of the Design Review Report

d. Submission and approval of the Interim and Final Construction Phase Commissioning Plans

e. Commissioning Kickoff Meeting

f. Regular Commissioning Coordination Meetings

g. Installation of permanent utilities (gas, water, electric, steam)

h. Building Enclosure Construction

i. Submission and approval of the Completed Building Enclosure Inspection

Checklists

j. Manufacturer's Equipment Start-Up for each of the systems to be commissioned

k. Submission and approval of the Completed Commissioning Observation Checklists

l. Submission and approval of Certificate of Readiness for each system to be commissioned

m. Commissioning Testing, including Functional Performance Testing, for each system to be commissioned

o. Post-test deficiency correction for each system to be commissioned

p. Re-Testing

s. Training for each of the systems to be commissioned

t. Submission and approval of the Initial and Final Commissioning Reports

u. Final testing required to be witnessed by Government Acceptance Testing Representatives, as identified in system level sections.

1.9 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Completed Construction Observation Checklists
Interim Construction Phase Commissioning Plan
Final Construction Phase Commissioning Plan
Initial Commissioning Report
Issues Log

SD-07 Certificates

Commissioning Firm

SD-10 Operation and Maintenance Data

Systems Manual

SD-11 Closeout Submittals

Final Commissioning Report
Updated Final Commissioning Report
Final Commissioning Report (eNotebook)
Updated Final Commissioning Report (eNotebook)

1.10 COMMISSIONING FIRM

Employ the services of a Commissioning Firm and all Commissioning Specialists required to perform work for this project. The Commissioning Firm must be a first-tier subcontractor that is financially and corporately independent from prime contractor and all other subcontractors

and the Designer of Record and that is not participating in any other work on this Contract, including design, furnishing equipment, construction, or testing, adjusting, and balancing.

a. Submit the Commissioning Firm's and Commissioning Specialists' qualifications, including the name of the firm and each CxC and each certification, no later than 60 calendar days after contract award.

b. If, for any reason, a specialist loses a certification during this period, immediately notify the Contracting Officer and submit another Commissioning Specialist for approval. An approved successor must validate all work performed for this project by the CxC who lost a certification.

1.10.1 Commissioning Specialists (CxC)

Assign Lead Commissioning Specialist and other appropriate Commissioning Specialists for the systems to be commissioned.

1.10.1.1 Lead Commissioning Specialist (CxC)

Lead Commissioning Specialist (CxC) coordinates all aspects of the commissioning process. Duties include leading and overseeing the commissioning work and acting as the primary point of contact for the commissioning work. CxC may serve as a systems Specialist if all requirements for both designations are met. CxC must have a minimum of five years of commissioning experience, including two projects of similar size and complexity to this project.

CxC must be certified in one of the following:

NEBB Building System Commissioning Professional (CxCP)

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).

1.10.1.2 Commissioning Specialists

Refer to the related technical commissioning specification section for additional qualifications for each Commissioning Specialist associated with each system. Include all Commissioning Specialist qualifications with the Commissioning Firm submittal:

a. Mechanical Commissioning Specialist: The technical work associated with mechanical systems to be commissioned must be performed by a Commissioning Specialist certified by NEBB, ACG, ICB/TABB, AEE, University of Wisconsin-Madison, ASHRAE, or BCA in the commissioning of HVAC systems with five years of experience in the commissioning of HVAC systems.

b. Electrical Commissioning Specialist: The technical work associated with electrical systems to be commissioned must be performed by an engineering technician with five years of experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

c. Building Enclosure Commissioning Specialist: The technical work associated with the Building Envelope system must be performed by a Building Enclosure Commissioning Specialist that is a registered architect or engineer, or building scientist, with five years of building enclosure design or construction experience or a professional with training and Certification in Building Enclosure Commissioning from a third-party certification organization plus five years of commissioning experience. The commissioning provider must have the necessary training, experience, and FPT equipment.

1.11 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 these acceptable standards: ACG Commissioning Guideline, NEBB S1110, ANSI/SMACNA 014, or ASHRAE 202. In a conflict, the most stringent requirements apply. In addition, comply with ASHRAE 90.1 - IP commissioning requirements for all systems. Refer to related technical commissioning specification sections for additional standards requirements.

Comply with applicable International Electrical Testing Association (NETA) testing standards for electrical systems. The following requirements apply to all project commissioning and test standards:

a. Implement all recommendations and suggested practices contained in the Commissioning Standard and 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 by the body responsible for the applicable Commissioning Standards at the time of project award.

g. If there is a conflict between the requirements of the contract documents and the commissioning standard used, the contract documents take precedent.

1.12 SUSTAINABILITY THIRD PARTY CERTIFICATION (TPC)

The Commissioning Specialist must perform all commissioning activities, coordination, and submittals required by the sustainability Third Party Certification (TPC) program applied to this project, in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

1.13 ISSUES LOG

The Commissioning Specialist develops and maintains an Issues Log for the systems to be commissioned. The issues log documents and tracks resolution of deficiencies identified during submittal reviews, inspection, and testing. 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. For each issue, the Issues Log includes, but is not limited to, a unique reference number, description of the issue with contract requirement referenced, location of or equipment name/tags exhibiting the issue, the initials of the individual's name whom reported the issue, the date of first observation, the proposed resolution of the issue and date proposed, the date of any subsequent observations with applicable additional information, and the date of implementation of the final resolution of the issue as confirmed by the Commissioning Specialist and Contracting Officer. Issues must not be deleted from the issues log.

CxC must submit the Issues Log monthly and within three working days from changes to the Issue Log. The CxC is responsible for distributing the Issues Log to the Commissioning Team. The QC manager is responsible for notifying the CxC and Contracting Officer of outstanding deficiencies and tracking them to resolution in accordance with Section 01 45 00 QUALITY CONTROL, "QC Plan".

1.14 CERTIFICATE OF READINESS

Prior to scheduling Commissioning Tests for each system, the QC Manager must issue a Certificate of Readiness for each system, certifying that inspections have been completed, open issues have been resolved, and the system is ready for Commissioning Tests. Refer to each related technical commissioning specification section for additional requirements.

Submit the Certificate of Readiness for each system 20 working days prior to Commissioning Tests of that system. Do not schedule Commissioning Tests for a system until the Certificate of Readiness is approved by the Government.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CONSTRUCTION SUBMITTAL REVIEWS

Coordinate construction submittal document reviews for commissioned systems and assemblies with the CxC. The commissioning submittal review does not replace the Government submittal review, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

The CxC must identify construction submittals to be provided by the

contractor for the commissioned systems. The CxC must evaluate construction submittals for compliance with the contract documents. Include a copy of the submittal document review transmittal and response in the Commissioning Report.

3.2 COMMISSIONING KICKOFF MEETING

Conduct a Commissioning Kickoff Meeting, led by the CxC, after approval of the Commissioning Firm and Commissioning Specialists, and no later than 60 days following construction notice to proceed. 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 section.

The Construction Manager, QC team, DOR, and the Government Acceptance Testing Representatives and other Government team members must attend this meeting. Invite the User and a Public Works Division Representative to attend this meeting.

3.3 REGULAR COMMISSIONING COORDINATION MEETINGS

The QC team, DOR, and the Government Acceptance Testing Representatives and other Government team members must attend this meeting. Sub-Contractor Representatives for each trade responsible for construction/installation of systems to be commissioned must attend this meeting as requested by the CxC. Invite the User and a Public Works Division Representative to attend this meeting.

CxC must conduct monthly commissioning coordination meetings when installation of commissioned systems begins. Provide status of commissioned systems, open issues log items, outstanding submittals, and upcoming commissioning activities. Conduct bi-weekly commissioning coordination meetings within 30 days of the scheduled date for commissioning testing.

3.4 CONSTRUCTION PHASE COMMISSIONING PLANS

The Interim Construction Phase Commissioning Plan identifies 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 Enclosure Inspection Checklists. Submit the Interim Construction Phase Commissioning Plan, prepared by the CxC, 14 calendar days after the Construction Commissioning Coordination Meeting and 14 days prior to the start of construction of the building enclosure. Include the following items in the commissioning schedule in addition to the items in paragraph PROJECT SCHEDULE: Seasonal Testing, Warranty Phase Site Visit, Post-Construction Endurance Testing, and Updated Commissioning Report.

The Final Construction Phase Commissioning Plan includes the information provided in the Interim Construction Phase Commissioning Plan as well as commissioning construction observation checklists and test procedures such as Pre-Functional Checklists and Functional Performance Test Checklists and other Commissioning 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. Refer to the related technical commissioning specification section for additional requirements for checklists. Submit the Final Construction Phase Commissioning Plan,

prepared by the CxC, no later than 90 calendar days prior to the start of Commissioning Inspections. Once approved, file the approved plan in the Sustainability eNotebook.

3.4.1 Construction Observation Checklists

Construction Observation Checklists must include items for physical inspection or testing that demonstrate that installation and start-up of equipment and systems is complete. Refer to paragraph COMMISSIONING INSPECTIONS. Construction observation checklists must be tailored to verify the specific installation requirements and details of the construction documents and manufacturer's instructions.

3.4.2 Test Procedures and Checklists

Test procedures and checklists must include procedures that explain, step-by-step, the actions and expected results that will demonstrate that the systems perform in accordance with the contract. Refer to paragraph COMMISSIONING TESTS. Include the following sections and details appropriate to the systems being tested in the test procedures and 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 approved 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. As-found condition of the system operation

h. List of test items with step numbers along with the corresponding feature or operation, intended test procedure, expected system response, and pass/fail indication.

i. Space for comments for each test item.

3.5 COMMISSIONING INSPECTIONS

Complete inspections using Construction Observation Checklists for each individual item of equipment or system for each system required to be commissioned in accordance with the commissioning plan. Indicate commissioning team member inspection and validation of each checklist item by initials. Validation of each checklist item by each team member indicates that item conforms to the contract documents and design in their area of responsibility. Commissioning Specialist validation of each checklist item indicates that each item has been installed correctly and in accordance with contract documents. Submit the initialed and Completed Construction Observation Checklists no later than 7 calendar days after

completion of inspection of all checklists items for each system.

3.6 COMMISSIONING TESTS

Demonstrate that all systems, equipment, and components have been installed correctly and that the systems operate and perform, including interactive operation between systems, in accordance with contract documents. Perform tests as specified in related technical commissioning specifications. Provide all materials, services, and labor required to perform all commissioning tests.

Commissioning Specialist's duties include leading and documenting all tests for the systems to be commissioned with appropriate sub-contractors performing the Tests. The representatives listed in the paragraph COMMISSIONING TEAM must attend the tests with the exception of the Construction Manager.

3.6.1 Test Scheduling and Coordination

Schedule Commissioning 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 Commissioning tests.

Commissioning Tests must be performed with the CxC present. Government reserves the right to witness all tests. Coordinate test schedule with Government representatives.

3.6.2 Testing Procedures

Commissioning tests include tests such as functional performance and integrated systems tests. For electrical systems testing, include testing of sensor calibrations, control responses, safeties, interlocks, operating modes, capacity, lighting levels, and verification of all other electrical system contract performance requirements. Perform test procedures in accordance with the commissioning standards specified. In addition, comply with the testing procedures specified in the sections listed in paragraph RELATED SECTIONS.

3.6.3 Sample Strategy

Refer to the sections identified in paragraph RELATED SECTIONS for sample strategy.

For electrical systems, test 100 percent of all equipment and systems except for the following. Test at the sample rate shown:

a. Lighting Controls
b.
c.

3.6.4 Aborted Tests and Re-Testing

Abort any test if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. Re-test after all deficiencies identified during the original test have been corrected. Contracting Officer may withhold payment equivalent to lost time, re-testing, and aborted tests. These costs may include salary, travel costs, and per diem for Government team members.

3.7 TRAINING PLAN

CxC must review the training plan for training associated with the equipment and systems to be commissioned, checking that each plan has the trainer name, trainer contract information, training schedule, and location. Submit review at least 30 days prior to the first training event. Incorporate CxC review comments prior to submitting training plan in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Update and resubmit the training plan based on any corrective action taken.

3.8 SYSTEMS MANUAL

The Systems Manual includes 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 for all commissioned systems. Update and resubmit the system manual information based on any corrective action taken during the warranty period.

3.9 COMMISSIONING REPORT

Submit an Initial Commissioning Report no later than 14 calendar days following commissioning team validation of all Commissioning Tests, including Functional Performance Tests,, with the exception of Seasonal Tests. Submit a Final Commissioning Report upon completion of training and trend log reviews. File the approved Final Commissioning Report (eNotebook) in the Sustainability eNotebook. Include the following information in the Final Commissioning Report:

a. An executive summary describing the overall commissioning process, the results of the commissioning process, outstanding deficiencies and recommended resolutions, and seasonal testing that must be scheduled for a later date. Indicate, in the executive summary, whether the systems meet the requirements of the contract documents.

b. A list of deficiencies discovered during the commissioning process and the corrective actions taken in the report.

c. Completed Pre-Functional Checklists and other Commissioning Observation Checklists, Commissioning Test Checklists such as Functional Performance Test Checklists the Final Construction Phase Commissioning Plan, the Issues Log, Training Attendance Rosters, the Design Review Reports, Submittal Review Report, and any other documents as specified by related technical commissioning specification sections.

3.10 WARRANTY PHASE SITE VISIT

The Lead Commissioning Specialist 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, and identify any deficiency of the building systems to operate in accordance with the contract documents. The Commissioning Specialist must notify the Contracting Officer of any identified deficiencies and the proposed corrective action. Submit Updated Final Commissioning Report and Systems Manuals, documenting the results of the warranty phase

inspection. Include other warranty or post-construction phase activities as specified in related technical commissioning specification sections, such as Seasonal testing results and Post-Construction Endurance Test and Trend Log Report. File the approved Updated Final Commissioning Report (eNotebook) in the Sustainability eNotebook.

APPENDIX A - OWNER'S PROJECT REQUIREMENTS DOCUMENT

-- End of Section --

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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.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K	(2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25	(Jun 2000; Reaffirmed Oct 2010) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders; https://www.dla.mil/Portals/104/Documents/Dispositions/ddsr/docs/cylinderjointpub.pdf

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures
MIL-STD-129	(2014; Rev R; Change 1 2018; Change 2 2019; Change 3 2023) Military Marking for Shipment and Storage

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(2016; Rev L; Change 2) Obstruction Marking and Lighting

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61	National Emission Standards for Hazardous Air Pollutants

40 CFR 82	Protection of Stratospheric Ozone
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

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 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

1.2.2 Demolition/Deconstruction 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 detailed description of methods and equipment to be used for each operation and of the sequence of operations.

1.2.3 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site. The work includes demolition 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. Do not overload pavements to remain.

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 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 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 6 foot high fence. Erect and secure fence a minimum of 5 feet 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.

1.3.3 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.

1.3.4 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 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan

Existing Conditions

SD-07 Certificates

Notification

SD-11 Closeout Submittals

Receipts

1.6 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify 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.

1.6.1 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, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.7 PROTECTION

1.7.1 Traffic Control Signs

a. Where pedestrian and driver and aircraft 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 100 feet, but less than 200 ft, above ground level. The use of LED based obstruction lights are not permitted. For temporary structures (including cranes) over 200 ft 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.

1.7.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the 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.

1.8 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. Provide a barricade consisting of a fence covered with a fabric designed to stop the spread of

debris. Anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

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 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 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.

PART 2 PRODUCTS

Not used.

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 in their entirety including all foundation elements. Overhead and underground utility lines will be terminated as indicated. The concrete slab, walkway, and footings shall also be removed. The demolished sites will be backfilled, leveled, and seeded unless otherwise indicated. 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. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Contracting Officer.

c. Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

d. Building, or the remaining portions thereof, not exceeding 80 feet in height may be demolished by the mechanical method of demolition.

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 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 uncovered by work 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 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas.

3.1.4 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated to a depth of 16 inches below new finish grade. Provide neat sawcuts at limits of pavement removal as indicated. Move, grind and store pavement and slabs designated to be recycled and utilized in this project as directed by the Contracting Officer. Remove pavement and slabs not to be used in this project from the installation at Contractor's expense.

3.1.5 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. 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.

3.1.6 Structural Steel

Dismantle structural steel at field connections and in a manner that will prevent bending or damage. Salvage for recycle structural steel, steel joists, girders, angles, plates, columns and shapes. Transport structural

steel shapes to a designated recycling facility, stacked according to size, type of member and length, and stored off the ground, protected from the weather.

3.1.7 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. 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. Recycle scrap metal as part of demolition operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.8 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: Completely fill holes and depressions, left as a result of removals in existing masonry walls to remain.

3.1.9 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.

3.1.9.1 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.

3.1.9.2 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.

3.1.9.3 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.

3.1.9.4 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

All materials and equipment removed 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.

3.3.2 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Turn over recovered ODS to the Contracting Officer. Dispose products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) in accordance with 40 CFR 82. Submit Receipts or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

3.3.2.1 Special Instructions

No more than one type of ODS is permitted in each container. Apply a warning/hazardous label to the containers in accordance with Department of Transportation regulations. Provide a tag with the following information on all cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS:

a. Activity name and unit identification code

b. Activity point of contact and phone number

c. Type of ODS and pounds of ODS contained

d. Date of shipment

e. National stock number (for information, call (804) 279-4525).

3.3.2.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.3.3 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.4 CLEANUP

Remove debris and rubbish from basement 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.

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 as directed.

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SECTION 02 41 01

BUILDING DECONSTRUCTION
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.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K	(2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

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 -- Safety and Occupational Health (SOH) Requirements

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25	(Jun 2000; Reaffirmed Oct 2010) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders; https://www.dla.mil/Portals/104/Documents/Dispositions/ddsr/docs/cylinderjointpub.pdf

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures
MIL-STD-129	(2014; Rev R; Change 1 2018; Change 2 2019; Change 3 2023) Military Marking for Shipment and Storage

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 82	Protection of Stratospheric Ozone
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

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 Deconstruction Plan

Prepare a Deconstruction Plan and submit proposed salvage, deconstruction 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. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. 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 deconstruction until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes the value derived from the salvage and recycling of

materials. Remove rubbish and debris from the project site; do not allow accumulations. The work includes deconstruction, 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 or deconstruction work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by 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 and walls is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.3.3 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during 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.

1.3.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities 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 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 or deconstruction 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 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Deconstruction Plan;

Existing Conditions

SD-07 Certificates

Notification;

1.6 QUALITY ASSURANCE

Submit timely notification of deconstruction projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify 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.

1.6.1 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 for dust control. Vacuum and dust the work area daily.

1.7 PROTECTION

1.7.1 Protection of Personnel

Before, during and after the deconstruction work continuously evaluate conditions 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.

1.8 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.

1.9 EXISTING CONDITIONS

Before beginning any 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 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 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.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing materials 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.

Separate metal items derived from deconstruction activities. Items include miscellaneous metals, suspended acoustical grid, mechanical equipment and fixtures, piping, ductwork, electrical equipment and fixtures, wiring, conduit and similar metals not salvaged as described herein.

Comply with Air Station Order 5090.2B and deliver to the Material Recovery Facility located at 4638 Access Road, Marine Corps Air Station Cherry Point. Contact the Quality Recycling Manager, Stephanie Connor, at (252) 466-5376 for applicable procedures and protocols.

3.1.1 Utilities and Related Equipment

3.1.1.1 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 deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.1.2 Disconnecting Existing Utilities

Remove existing utilities 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 in accordance with instructions of the Contracting Officer.

3.1.2 Slabs

Remove sawcut concrete slabs . Provide neat sawcuts at limits of pavement removal as indicated. Dispose of slab debris at Contractor's expense.

Neatly sawcut concrete openings. Restore concrete to a thickness matching that adjoining.

Excavation at foundations and beneath slabs on grade is unclassified. Remove material to support constructions at the subgrades stipulated. Furnish patching underlayment compounds to transition floor height differentials exceeding 0.5 inches. Prepare adjoining existing floors to prevent substrate telegraphing through finish flooring.

3.1.3 Masonry

Neatly sawcut masonry openings.

Continue the bond of adjoining walls when performing masonry infill and repairs. Alternate head joints between courses. Patch masonry holes and smooth uneven surfaces that become exposed. Match the texture of adjacent painted surfaces by applying additional coats of block filler and paint to unpainted masonry units.

Restore wall constructions using masonry shapes matching that adjoining. Install concrete masonry unit lintels with adequate jamb bearing. Create smooth, continuous replacement jambs with double corner concrete masonry units where exposed. Bore holes in hollow metal jambs to anchor frames and solidly grout in place. Repair hollow metal frame holes with smooth, seamless patches. Caulk both sides of frame perimeters and jamb feet for a neat finish.

Repair surfaces that become exposed where selective demolition removes masonry walls flush with masonry to remain. Grind protruding horizontal joint reinforcement below finished surfaces. Repair wall penetrations, patch holes and install concrete masonry unit shells to restore surfaces to smooth substrates. Match the texture of adjacent painted surfaces by applying additional coats of block filler and paint to unpainted concrete masonry units.

3.1.4 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. 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.

3.1.5 Wallboard

Neatly cut wallboard openings.

Work wallboard to accommodate scheduled penetrations and openings. Finish penetration perimeters with mesh and joint compound. Create smooth and seamless transitions to adjoining walls. Patch gypsum board holes and smooth uneven finishes that become exposed. Match the texture of adjacent painted surfaces by applying additional coats of primer and paint to unpainted wallboard.

Cut wallboard infill and repairs back to the nearest framing members. Finish the resulting joints with mesh and joint compound. Create smooth and seamless transitions to adjoining walls. Patch gypsum board holes and smooth uneven finishes that become exposed. Match the texture of adjacent painted surfaces by applying additional coats of primer and paint to unpainted wallboard.

Restore wall constructions using studs and wallboard matching that adjoining. Install headers with adequate jacks in load bearing walls. Finish the resulting joints with mesh and joint compound. Bore holes in hollow metal jambs to anchor frames to studs. Repair hollow metal frames holes with smooth, seamless patches. Caulk both sides of frame perimeters and jamb feet for a neat finish.

Repair surfaces that become exposed where selective demolition removes wallboard partitions flush with wallboard to remain. Repair wall penetrations, patch holes and install wallboard patches to restore surfaces to smooth substrates. Finish the resulting joints with mesh and joint compound. Match the texture of adjacent painted surfaces by applying additional coats of primer and paint to unpainted wallboard.

3.1.6 Miscellaneous Metal

Recycle shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal doors and similar items as whole units. Recycle light-gage and cold-formed metal framing, such as steel studs, metal toilet partitions, toilet accessories and similar items. Recycle scrap metal as part of deconstruction operations. Transport to the Material Recovery Facility and coordinate with the Waste Management Plan.

3.1.7 Finish Flooing Removal

Use hand tools and similar methods that do not create excessive dust when separating non hazardous floor covering compositions from substrates. Do not sand, drill, saw, blast or mechanically abrade floor coverings. Dampen flooring debris when dry sweeping or dry scraping produces excessive dusting. Do not saturate floors or debris. Remove residual adhesive using mechanical cleaning methods. Do not use hydrocarbon petrochemicals or solvents to alter adhesive composition.

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.

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 floors and walls to remain, with an approved 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. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

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. Recycle each item of equipment and fixtures as a whole unit. Transport equipment and fixtures, including motors and machines, to the Material Recovery Facility and coordinate with the Waste Management Plan.

3.1.14.1 Preparation for Recycling

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.

3.1.14.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for recycling. Transport to the Material Recovery Facility and coordinate with the Waste Management Plan.

3.1.14.3 Ducts

Recycle duct work. Transport to the Material Recovery Facility and coordinate with the Waste Management Plan.

3.1.15 Electrical Equipment and Fixtures

Recycle panelboards, conduit, conductors, wiring systems and components. Transprot to the Material Recovery Facility and coordinate with the Waste Management Plan.

3.1.15.1 Fixtures

Recycle electrical fixtures. Transport to the Material Recovery Facility and coordinate with the Waste Management Plan.

3.1.16 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

3.2 DISPOSITION OF MATERIAL

3.2.1 Title to Materials

Except for recycled items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused, recycled or salvaged, become the property of the Contractor and must be removed from Government property. Title to materials resulting from 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.

3.2.2 Reuse of Materials and Equipment

Reuse materials and equipment =listed =in the =Deconstruction= Plan, and reinstall as the work progresses. Coordinate the re-use of materials and equipment with the re-use requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture re-use of materials

in the diversion calculations for the project.

3.2.3 Salvaged Materials and Equipment

Salvage and recycle materials and equipment that are specified to be removed by the Contractor.

a. Salvage items and material to the maximum extent possible.

b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. Coordinate the salvaged materials with tracking requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture salvaged materials in the diversion calculations for the project.

c. Remove salvaged items to remain the property of the Government to the Material Recovery Facility.

3.2.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS must be Remove recovered ODS from Government property and dispose of in accordance with 40 CFR 82.

3.2.4.1 Special Instructions

No more than one type of ODS is permitted in each container. Apply a warning/hazardous label to the containers in accordance with Department of Transportation regulations. Provide a tag with the following information on all cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS:

a. Activity name and unit identification code

b. Activity point of contact and phone number

c. Type of ODS and pounds of ODS contained

d. Date of shipment

e. National stock number (for information, call (804) 279-4525).

3.2.4.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.2.5 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.2.6 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable noncombustible material in an off site landfill.

3.3 CLEANUP

Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.4 DISPOSAL OF REMOVED MATERIALS

3.4.1 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.

3.4.2 Removal from Government Property

Transport waste materials removed from deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

-- End of Section --

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SECTION 02 82 00

ASBESTOS REMEDIATION
11/18, CHG 1: 11/19

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 SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2	(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM C732	(2017; R 2022 Standard Test Method for Aging Effects of Artificial Weathering on Latex Sealants
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2024) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E119	(2022) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E736/E736M	(2019) Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
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	(2020) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2023; ERTA 1 2023) 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 -- Safety and Occupational Health (SOH) Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90/018	(1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance
EPA 560/5-85-024	(1985) Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147	The Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1926.51	Sanitation
29 CFR 1926.59	Hazard Communication
29 CFR 1926.103	Respiratory Protection
29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.1101	Asbestos
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

U.S. NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND (NAVFAC)

NAVFAC P-502	(2017) Asbestos Program Management
ND OPNAVINST 5100.23	(2005; Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

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 0.00042 psi.

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 percent.

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 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 supervisor, or its equivalent. The competent person must have a current State of North Carolina asbestos contractors or supervisors license.

1.2.11 Contractor

The Contractor is that individual, or entity under contract to perform the herein listed work.

1.2.12 Disposal Bag

A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926.1101, used for transporting asbestos waste from containment to disposal site.

1.2.13 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 60 inches in length and width in order to access a building component.

1.2.14 Encapsulation

The abatement of an asbestos hazard through the appropriate use of chemical encapsulants.

1.2.15 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).

1.2.16 Friable Asbestos Material

A term defined in 40 CFR 61-SUBPART M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

1.2.17 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.2.18 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.

1.2.19 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.

1.2.20 Model Accreditation Plan (MAP)

USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.

1.2.21 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

1.2.22 NESHAP

National Emission Standards for Hazardous Air Pollutants. The USEPA

NESHAP regulation for asbestos is at 40 CFR 61-SUBPART M.

1.2.23 Nonfriable Asbestos Material

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.

1.2.24 Permissible Exposure Limits (PELs)

1.2.24.1 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).

1.2.24.2 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.

1.2.25 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.

1.2.26 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.27 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 State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Air Monitor; and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The QP must be qualified to perform visual inspections as indicated in ASTM E1368. The QP must be appropriately licensed in the State of North Carolina .

1.2.28 TEM

Refers to Transmission Electron Microscopy.

1.2.29 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

1.2.30 Transite

A generic name for asbestos cement wallboard and pipe.

1.2.31 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 0.00042 psi.

1.2.32 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 or by the state where the work is to be performed. The worker must be appropriately licensed in the State of North Carolina .

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 at includes the demolition, removal,or encapsulation of the following materials governed by 40 CFR 763 and NAVFAC P-502:

- Textured Wall Coating located in the USPS loading dock hallway (600 sqft)

Provide negative pressure enclosure 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

Both composite samples of the wallboard and discrete samples of the components (wallboard and joint compound) have been tested and results are attached.

1.3.2 Unexpected Discovery of Asbestos

Notify the Contracting Officer if any previously untested building components suspected to contain asbestos are impacted by the work.

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 State or local 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 or State training criteria whichever is more stringent. 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. Asbestos workers must have a current State of North Carolina asbestos worker's license.

1.3.5 Permits, Licenses, and Notifications

Prior to the start of work, obtain necessary permits and licenses in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by Federal, State, regional, and local authorities. Notify the North Carolina Health Hazards Control Unit and the Contracting Officer in writing 10 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M. Notify the Contracting Officer and other appropriate Government agencies in writing 10 working days prior to the start of asbestos work as indicated in applicable laws, ordinances, criteria, rules, and regulations. 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 Federal, State, regional, and local authorities 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, 40 CFR 763 and ND OPNAVINST 5100.23. 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. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

1.3.7 Respiratory Protection Program

Establish and implement a respirator program as required by 29 CFR 1926.1101, and 29 CFR 1926.103. Submit a written description of the program to the Contracting Officer. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

1.3.7.1 Respirator Program Records

Submit records of the respirator program as required by 29 CFR 1926.103, and 29 CFR 1926.1101.

1.3.7.2 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.

1.3.7.3 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 Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered.

1.3.8 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.

1.3.9 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.

1.3.10 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 encapsulation, removal, and/or 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, encapsulation 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.

1.3.11 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the sampling, analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and permits and certification that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by successful participation of the laboratory in the 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.

1.3.12 Landfill Approval

Submit written evidence that the landfill is approved for asbestos disposal by the U.S. Environmental Protection Agency and local 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 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 State and local regulatory agency requirements.

1.3.14 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

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Amended Water;

Safety Data Sheets (SDS) for All Materials;

Encapsulants;

Respirators;

Local Exhaust Equipment;

Pressure Differential Automatic Recording Instrument;

Vacuums;

Glovebags;

SD-06 Test Reports

Air Sampling Results;

Pressure Differential Recordings for Local Exhaust System;

Clearance Sampling;

Asbestos Disposal Quantity Report;

SD-07 Certificates

Employee Training;

Notifications;

Respiratory Protection Program;

Asbestos Hazard Abatement Plan;

Testing Laboratory;

Landfill Approval;

Delivery Tickets;

Waste Shipment Records;

Transporter Certification;

Medical Certification;

Private Qualified Person Documentation;

Designated Competent Person;

Worker's License;

Contractor's License;

Federal, State or Local Citations on Previous Projects;

Encapsulants;

Equipment Used to Contain Airborne Asbestos Fibers;

Water Filtration Equipment;

Vacuums;

Ventilation Systems;

SD-11 Closeout Submittals

Permits and Licenses;

Notifications;

Respirator Program Records;

Rental Equipment;

1.5 QUALITY ASSURANCE

1.5.1 Private Qualified Person Documentation

Submit the name, address, and telephone number of the Private Qualified Person (PQP) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, 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, Air Monitor, and Asbestos Project Designer as described by 40 CFR 763 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The PQP must be appropriately licensed in the State of North Carolina as a Project Air Monitor. 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.

1.5.2 Designated Competent Person Documentation

The Designated 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, and notification of other employees onsite. The Designated Competent Person must be on-site at all times when asbestos abatement activities are underway.Submit training certification and a current State of North Carolina Asbestos Contractor's and Supervisor's License. Submit evidence that the Designated Competent Person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA designated competent person requirements. The Designated Competent Person must be a first tier subcontractor.

1.5.3 Worker's License

Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M and have a current State of North Carolina Asbestos Workers License.

1.5.4 Contractor's License

Submit a copy of the asbestos contractor's license issued by the State of North Carolina. 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, State and local requirements 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.

1.5.5 Air Sampling Results

Complete fiber counting and provide results to the PQP and GC for review within 24 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 employee performing air sampling, the employee that analyzed the sample, and the PQP and GC. 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. In no circumstance must levels exceed 0.1 fibers per cubic centimeter.

1.5.6 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches 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.

1.5.7 Protective Clothing Decontamination Quality Control Records

Reusable protective clothing not allowed.

1.5.8 Protective Clothing Decontamination Facility Notification

Reusable protective clothing not allowed.

1.5.9 Federal, State or Local Citations on Previous Projects

Submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities within the last 5 years (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company must be provided.

1.5.10 Preconstruction Conference

Conduct a safety preconstruction conference to discuss the details of the Asbestos Hazard Abatement Plan, 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, Designated IH 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.

1.7 EQUIPMENT

1.7.1 Rental Equipment

Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

Encapsulants must conform to current USEPA requirements, contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and conform to the following performance requirements.

2.1.1 Removal Encapsulants

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.2 Bridging Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test

Requirement	Test Standard
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.3 Penetrating Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E119
Fire Resistance - Negligible affect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.4 Lock-down Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible affect on fire resistance rating over 3-hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E119

Requirement	Test Standard
Bond Strength: 100 pounds of force/foot	ASTM E736/E736M
(Tests compatibility with cementitious and fibrous fireproofing)	

2.2 ENCASEMENT PRODUCTS

Encasement must consist of primary cellular polymer coat, polymer finish coat, and any other finish coat as approved by the Contracting Officer.

2.3 DUCT TAPE

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

2.4 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

2.5 SHEET PLASTIC

Sheet plastic must be polyethylene of 6 mil minimum thickness and must be provided in the largest sheet size necessary to minimize seams. Film must be clear or frosted and conform to ASTM D4397, except as specified below

2.5.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets must be provided. Film must be frosted and must conform to the requirements of NFPA 701.

2.5.2 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.

2.6 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 140 degrees F.

2.7 LEAK-TIGHT WRAPPING

Two layers of 6 mil 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.

2.8 VIEWING INSPECTION WINDOW

Where feasible, a minimum of one clear, 1/8 inch thick, acrylic sheet, 18 by 24 inches, 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.

2.9 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 equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. 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.

d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands when conducting environmental area sampling using NIOSH NMAM Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).

e. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

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. Breathing air must comply with CGA G-7.

3.1.3 Exterior Whole Body Protection

3.1.3.1 Outer Protective Clothing

Provide personnel exposed to asbestos with disposable "non-breathable," 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 Work Clothing

Provide cloth work clothes for wear under the outer protective clothing and foot coverings and either dispose of or properly decontaminate them as recommended by the PQP after each use.

3.1.3.3 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. 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 integral with each asbestos control area.

3.1.3.4 Decontamination of Reusable Outer Protective Clothing

Reusable outer protective clothing shall not be used.

3.1.3.5 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 Spanish 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 20 by 14 inches displaying the following legend in the lower panel:

Legend	Notation
DANGER	one inch Sans Serif Gothic or Block
ASBESTOS	one inch Sans Serif Gothic or Block
MAY CAUSE CANCER	one inch Sans Serif Gothic or Block
CAUSES DAMAGE TO LUNGS	1/4 inch Sans Serif Gothic or Block
AUTHORIZED PERSONNEL ONLY	1/4 inch Sans Serif Gothic or Block
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA	1/4 inch 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 ASSP 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 0.02 inch 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 ASSP 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 ASSP 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.

3.1.11 Single Stage Decontamination Area

A decontamination area (equipment room/area) must be provided for Class I work involving less than 25 feet or 10 square feet 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 29 CFR 1926.1101, 40 CFR 61-SUBPART M, NAVFAC P-502, and as specified herein. Use wet removal procedures or appropriate encapsulation procedures as listed in the asbestos hazard abatement plan and negative pressure enclosure techniques. Wear and utilize protective clothing and equipment as specified herein. No eating, smoking, drinking, chewing gum, tobacco, or applying cosmeticsis permitted in the asbestos work or control areas. Personnel of other trades not engaged in the encapsulation or 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 work area heating, ventilating, and air conditioning system, and 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. 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 Contracting Officer, including visual inspection and air sampling. Work must resume only upon notification by the Contracting Officer. Corrective actions must be documented. If an asbestos fiber release or spill occurs outside of the asbestos control area, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, 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 and isolated by airtight seals to prevent the spread of contamination throughout the system. The airtight seals must consist of 2 layers of polyethylene. 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 and GC work

may proceed at the discretion of the Contracting Officer.

3.2.3 Furnishings

Furniture, furnishings, and equipment will be removed from the area of work by the Government before asbestos work begins.

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

3.2.5.1 Negative Pressure Enclosure

Removal of textured wall coating requires 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 6-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches 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.

3.2.5.2 Glovebag

Not applicable..

3.2.5.3 Regulated Area for Class II RemovalNot applicable.

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 6 mil 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 6 mil 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

Not applicable.

3.2.6.2 Exposed Pipe Insulation Edges

Contain edges of asbestos insulation to remain that are exposed by a removal operation. Wet and cut the rough ends true and square with sharp tools and then encapsulate the edges with a 1/4 inch thick layer of non-asbestos containing insulating cement troweled to a smooth hard finish. When cement is dry, lag the end with a layer of non-asbestos lagging cloth, overlapping the existing ends by at least 4 inches. When insulating cement and cloth is an impractical method of sealing a raw edge of asbestos, take appropriate steps to seal the raw edges as approved by the Contracting Officer.

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 Class I Work Procedures

In addition to 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 installation and operation of the control methods.

b. For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, place critical barriers over all openings to the regulated area.

c. HVAC systems must be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.

d. Impermeable dropcloths (6 mil or greater thickness) must be placed on surfaces beneath all removal activity.

e. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area must be ventilated with a HEPA unit and employees must use PPE.3.2.9 Specific Control Methods for Class I WorkUse Class I work procedures, control methods and removal methods for the following ACM:

a. Plaster and Textured Ceilings and Walls

3.2.9.1 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 0.02 inch 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.

3.2.9.2 Glovebag Systems

Not applicable.

3.2.9.3 Mini-Enclosure

Not applicable.

3.2.9.4 Wrap and Cut Operation

Not applicable.

3.2.9.5 Class I Removal MethodClass I ACM must be removed using a control method described above. Prepare work area as previously specified. Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area. Spread one layer of 6-mil seamless plastic sheeting on the floor below the work area. Remove ACM textured wall finish using a scraper and wet methods and immediately place into 6-mil thickness disposal bag. Floors are considered contaminated from fallen textured ceiling finish. Clean up debris on floor and dispose of carpet as asbestos contaminated material. After removal of the material use a wire brush to clean the exposed wall to remove residual material. Continue wet cleaning until surfaces are free of visible debris. Bag all asbestos debris which has fallen to the floor as asbestos-containing debris. Place all debris in plastic disposal bags of 6-mil minimum thickness. 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 6-mil 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 quantity of airborne asbestos fibers monitored at the breathing zone of the workers or the designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work, and immediately correct the situation.

3.2.10 Class II Work Procedures

Not applicable.

3.2.11 Specific Control Methods for Class II Work

3.2.11.1 Vinyl Flooring Materials and Mastic

Not applicable.

3.2.11.2 Sealants and Mastic

Not Applicable.

3.2.11.3 Suspect Fire Doors

Not applicable.

3.2.11.4 Roofing Materials

Not applicalbe.

3.2.11.5 Cementitious Siding and Shingles or Transite Panels

Not Applicable.

3.2.11.6 Gaskets

Not applicable.

3.2.12 Encapsulation Procedures

3.2.12.1 Preparation of Test Patches

Not applicable.

3.2.12.2 Field Testing

Not applicable.

3.2.12.3 Large-Scale Application

Not applicable.

3.2.13 Abatement of Asbestos Contaminated Soil

Not applicable.

3.2.14 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. 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.

3.2.14.1 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, removal, or encapsulation site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.14.2 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 24-hours (breathing zone samples), and 48-hours 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. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels. The written results must be signed by testing laboratory analyst, testing laboratory principal and the Contractor's PQP. The air sampling results must be documented on a Contractor's daily air monitoring log.

The PQP must provide personal sampling as indicated in 29 CFR 1926.1101. 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. 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 24-hours (breathing zone samples), and 48-hours hours (environmental/clearance monitoring) after completion of a sampling period. At the same time the PQP will provide area sampling 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. In addition, provided the same type of work is being performed, the PQP will provide area sampling 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. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels. The written results must be signed by testing laboratory analyst, testing laboratory principal and the Contractor's PQP. The air sampling results must be documented on a Contractor's daily air monitoring log.

3.2.14.3 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.

3.2.14.4 Final Clearance Requirements, EPA TEM Method

For EPA TEM sampling and analysis, using the EPA Method specified in 40 CFR 763, abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the five inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the three blank samples

must be analyzed. If the three blank samples are greater than 70 S/mm, resampling must be done. If less than 70 S/mm, the five outside samples must be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination must be considered complete. If the Z-test results are more than 1.65, the abatement is incomplete and cleaning must be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.14.5 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 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. Use transmission electron microscopy (TEM) to analyze clearance samples and report the results in accordance with current NIOSH criteria. Collect at least 5 samples per containment. The asbestos fiber counts from these samples must be less than less than 70 S/mm 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 TEM analysis at the Contractor's expense.

3.2.14.6 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.

3.2.15 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 or encapsulation in accordance with ASTM E1368. Inspect for any visible fibers, dust or debris. Spray apply a post removal (lock-down) encapsulant to ceiling, walls, floors and other areas exposed in the removal area. The exposed areaincludes but is not limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.16 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 applicable local, State, and Federal regulations and herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Coordinate all waste disposal manifests with the Contracting Officer and NAVFAC EV. 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 6 mils thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils thick bags with the approved warnings and DOT labeling 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 Environmental Protection Agency (EPA) or State-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 40 CFR 61-SUBPART M, State, 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 feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal.

Allow the GC to inspect, record and report the amount of asbestos containing material removed and released for disposal on a daily basis.

-- End of Section --

SECTION 02 83 00

LEAD REMEDIATION
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.

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2	(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2023; ERTA 1 2023) 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 -- Safety and Occupational Health (SOH) Requirements

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 1926.21	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
29 CFR 1926.103	Respiratory Protection
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
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

U.S. NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND (NAVFAC)

ND OPNAVINST 5100.23	(2005; Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

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 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.

1.2.2 Area Sampling

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

1.2.3 Certified Industrial Hygienist (CIH)

As used in this section refers to a person retained by the Contractor who is certified as an industrial hygienist and who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations. CIH must be certified for

comprehensive practice by the American Board of Industrial Hygiene. The Certified Industrial Hygienist must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.2.4 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 hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard. The Contractor may provide more than one CP as required to supervise and monitor the work.

1.2.5 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

1.2.6 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.

1.2.7 Deleading

Activities conducted by a person who offers to eliminate lead-based paint or lead-based paint hazards or to plan such activities in commercial buildings, bridges or other structures.

1.2.8 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead to which an employee is exposed, averaged over an 8-hour workday as indicated in 29 CFR 1926.62.

1.2.9 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

1.2.10 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

1.2.11 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.

1.2.12 Lead Control Area

A system of control methods to prevent the spread of lead 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.

1.2.13 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

1.2.14 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.

1.2.15 Personal Sampling

Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. 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 6 to 9 inches and centered at the nose or mouth of an employee.

1.2.16 Physical Boundary

Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

1.3 DESCRIPTION

Construction activities impacting PWL or material containing lead which are covered by this specification include the demolition or removal of material containing lead in poor condition, located in MCAS Cherry Point, Buildings 3918 and 153 as indicated on the drawings. Lead-containing paint was detected on the following surfaces:

- B3918: White drywall columns in retail areas;
- B3918: Grey metal door frames in retail areas;
- B3918: Yellow steel columns and support beams throughout;
- B3918: Red steel sprinkler piping throughout;
- B3918: Tan CMU walls and ceilings in shoe store storage;
- B3918: Beige CMU walls in both janitor's closets;
- B3918: Grey metal handrails on warehouse mezannine;
- B3918: Blue CMU walls in marketing offices;
- B3918: Blue metal door frames in administrative offices; and
- B3918: Brown metal door frames in break room/bathrooms.

- B153: White exterior wood siding under vinyl siding;
- B153: White exterior metal columns at exterior loading dock;
- B153: White wood door casings at exterior loading dock;
- B153: White pressboard walls in the MCAS side;
- B153: White wood window trim throughout; and
- B153: Beige concrete walls in the USPS vault.

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.

1.3.1 Protection of Existing Areas To Remain

Project work including, but not limited to, lead 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 Compliance Plan and describe how the Contractor will prevent lead exposure to other contractors and Government personnel performing work unrelated to lead activities.

1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Competent Person Qualifications

Training Certification

Occupational and Environmental Assessment Data Report

Medical Examinations

Lead Waste Management Plan

Licenses, Permits and Notifications

Occupant Protection Plan

Lead Compliance Plan

Initial Sample Results

Written Evidence of TSD Approval

SD-03 Product Data

Respirators

Vacuum Filters

Negative Air Pressure System

Materials and Equipment

Expendable Supplies

Local Exhaust Equipment

Pressure Differential Automatic Recording Instrument

Pressure Differential Log

SD-06 Test Reports

Occupational and Environmental Assessment Data Report

Sampling Results

Pressure Differential Recordings For Local Exhaust System

SD-07 Certificates

Testing Laboratory

Third Party Consultant Qualifications

Occupant Notification

Notification of the Commencement of LCP Hazard Abatement

Clearance Certification

SD-11 Closeout Submittals

Hazardous Waste Manifest

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Competent Person (CP)

Submit 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) which shows ability to assess occupational and environmental exposure to lead; 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). Submit proper documentation that the CP is trained and certified in accordance with federal, State of North Carolina, and local laws.

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the accredited training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62 and is certified to perform or supervise deleading, lead removal or demolition activities in the State of North Carolina.

1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air, soil, and wipe analysis, testing, and reporting of airborne concentrations of lead. 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. Laboratories selected to perform blood lead analysis must be OSHA approved.

1.5.1.4 Third Party Consultant Qualifications

Submit the name, address and telephone number of the third party consultant selected to perform the wipe sampling for determining concentrations of lead in dust. Submit proper documentation that the consultant is trained and certified as an inspector technician or inspector/risk assessor by the USEPA authorized State (or local) certification and accreditation program.

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities

a. Verify training meets all federal, State, and local requirements.

b. Review and approve Lead 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 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.

1.5.2.2 Lead Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of lead, LBP/PWL or MCL. Include in the plan a sketch showing the location, size, and details of lead 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 is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead 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.

In occupied buildings, the plan must also include an occupant protection program that describes the measures that will be taken during the work to notify and protect the building occupants.

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.

In order to reduce the full implementation of 29 CFR 1926.62 the Contractor must provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of 29 CFR 1926.62 and supporting the Lead Compliance Plan.

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. The data must represent the worker's regular daily exposure to lead for stated work.

b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62 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 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 compliance plan per 29 CFR 1926.62.

1.5.2.4 Medical Examinations

Submit pre-work blood lead levels and post-work blood lead levels for all workers performing lead activities during the execution of the work. Initial medical surveillance as required by 29 CFR 1926.62 must be made available to all employees exposed to lead 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 in excess

of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records must show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. 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, 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 and State of North Carolina 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.

b. Establish and implement a respiratory protection program as required by 29 CFR 1926.103, 29 CFR 1926.62 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 Waste Management

The Lead Waste Management Plan must comply with applicable requirements of federal, State, 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 USEPA manifests and USEPA Identification numbers, if applicable.

d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.

e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

g. 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.

h. Include any process that may alter or treat waste rendering a

hazardous waste non hazardous.

i. 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 federal, State, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62, EM 385-1-1, ND OPNAVINST 5100.23. 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 and State laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead-contaminated materials may apply:

a. North Carolina General Statutes §130A-453.22-453.31 and the rules adopted to implement the Lead-Based Paint Hazard Management Program for Renovation, Repair and Painting (LHMP-RRP) 10A NCAC 41C .0900

1.5.3 Pressure Differential Recordings for Local Exhaust System

1.5.4 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.

1.5.5 Occupant Protection Plan

The certified project designer must develop and implement an Occupant Protection Plan describing the measures and management procedures to be taken during lead hazard abatement activities to protect the building occupants/building facilities and the outside environment from exposure to any lead contamination while lead hazard abatement activities are performed.

1.5.6 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Lead Waste Management Plan and the Lead 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 dust, fume and mist. Respirators must comply with the requirements of 29 CFR 1926.62.

1.6.2 Special Protective Clothing

Personnel exposed to lead contaminated dust must wear proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. 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 removal work within the lead 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 ASSP 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 0.02 inch of water column 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 2.5 inches of water static pressure differential on a magnehelic gauge.

d. Equip the unit with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inch of water 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 1,100 degrees F. Heat blower must be (grounded) 120 volts ac, and must be equipped with cone, fan, glass protector and spoon reflector nozzles.

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 6 mils thick (4 mils 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 contaminated debris must be polyethylene plastic that is a minimum of 6 mils 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 6 mil, 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 2 inches wide, industrial strength.

2.1.1.5 Containers

When used, containers must be leak-tight and be labeled in accordance with EPA, DOT 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 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 10 days prior to the start of any lead work.

b. Occupant Notification

Submit occupant written acknowledgment of the delivery of lead hazard information pamphlet (EPA 747-K-99-001 "Protect Your Family From Lead in Your Home") prior to commencing the renovation work for each affected unit using language provided in 40 CFR 745 Subpart E.

c. Notification of the Commencement of LCP Hazard Abatement

3.1.1.2 Lead Control Area

a. Physical Boundary - Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area. Prohibit the general public from accessing the lead control areas.

b. Warning Signs - Provide warning signs at approaches to lead 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

The Government will remove furniture and equipment from the building before lead work begins.

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 control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.1.5 Local Exhaust System

Provide a local exhaust system in the lead control area in accordance with ASSP Z9.2, 29 CFR 1926.62 that will provide at least 4 air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the lead control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the lead control area of minus 0.02 inch 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 lead control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

3.1.1.6 Negative Air Pressure System Containment

a. Operate the negative air pressure systems to provide at least 4 air changes per hour inside the containment. Operate the local exhaust unit equipment continuously until the containment is removed. Smoke test the negative air pressure system for leaks at the beginning of each shift. The certified supervisor is responsible to continuously monitor and keep a pressure differential log with an automatic manometric recording instrument. Notify the Contracting Officer immediately if the pressure differential falls below the prescribed minimum. Submit the continuously monitored pressure differential log, as specified. Do not use the building ventilation system as the local exhaust system. Terminate the local exhaust system out of doors unless the Contracting Officer allows an alternate arrangement. All filters must be new at the beginning of the project and be periodically changed as necessary to maintain specified pressure differential and disposed of as lead contaminated waste.

b. Discontinuing Negative Air Pressure System. Operate the negative air pressure system continuously during abatement activities unless otherwise authorized by the Contracting Officer. At the completion of the project, units must be run until full cleanup has been completed and final clearance testing requirements have been met. Dismantling of the negative air pressure systems must conform to written decontamination procedures be as presented in the Lead Compliance Plan. Seal the HEPA filter machine intakes with polyethylene to prevent environmental contamination.

3.1.1.7 Decontamination Shower Facility

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

3.1.1.8 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.

3.1.1.9 Mechanical Ventilation System

a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.62. 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.

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.

3.1.1.10 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 control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Lead Control Area Requirements

Establish a lead 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 Work

Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when the work is performed in accordance with 29 CFR 1926.62 or 40 CFR 745, and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with federal, State, and local requirements.

3.3.2 Paint with Lead or Material Containing Lead Removal

Manual or power sanding or grinding of lead 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 is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize contamination of work areas outside the control area with lead contaminated dust or other lead contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

Provide methodology for lead, LBP/PWL removal and processes to minimize contamination of work areas outside the control area with lead contaminated dust or other lead contaminated debris/waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this lead,, LBP/PWL removal/control process in the Lead Compliance Plan.

3.3.2.1 Paint with Lead or Material Containing Lead - Indoor Removal

Perform manual,mechanical removal, and thermal cutting in the lead 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 federal, State, and local requirements.

3.3.2.2 Paint with Lead or Material Containing Lead - Outdoor Removal

Perform outdoor removal as indicated in federal, State, and local regulations and in the Lead Compliance Plan. The worksite preparation (barriers or containments) must be job dependent and presented in the Lead Compliance Plan.

3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead 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. Shower.

d. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate shower facility, shower.

e. 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 in accordance with 29 CFR 1926.62 and as specified herein. Air and wipe sampling must be directed or performed by the CP.

a. The CP 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 CP. 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 CP, within 72-hours after the air samples are taken.

d. Conduct area air sampling daily, on each shift in which lead and lead-based paint removal operations are performed, in areas immediately adjacent to the lead 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. If 30 micrograms of lead 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 and soil samples in accordance with methods defined by federal, State, and local standards inside and outside of the physical boundary to assess the degree of dust contamination in the facility prior to lead 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, conduct soil sampling if bare soil is present during external removal operations and collect wipe and soil samples according to the HUD protocol contained in HUD 6780 to determine the lead content of settled dust in micrograms per square meter foot of surface area and parts per million (ppm) for soil.

3.4.1.3 Testing of Material Containing Lead 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 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 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 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 CP must then certify in writing that the area has been cleaned of lead contamination before clearance testing.

3.5.1.1 Clearance Certification

If lead paint was disturbed by mechanical means, the CP must certify in writing that air samples collected outside the lead control area during paint removal operations are less than 30 micrograms of lead 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; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

Certify surface wipe samples are not significantly greater than the initial surface loading determined prior to work.

Clear the lead control area in industrial facilities of all visible dust

and debris.

For exterior work, soil samples taken at the exterior of the work site must be used to determine if soil lead levels have increased at a statistically significant level (significant at the 95 percent confidence limit) from the soil lead levels prior to the operation. If soil lead levels either show a statistically significant increase above soil lead levels prior to work or soil lead levels above any applicable federal or state standard for lead in soil, the soil must be remediated.

3.5.2 Disposal

a. Dispose of material, whether hazardous or non-hazardous in accordance with all laws and provisions and all federal, State 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 contaminated waste, scrap, debris, bags, containers, equipment, and leadcontaminated clothing that may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62 and 40 CFR 261, 40 CFR 262 and corresponding state regulations.

c. Dispose of lead contaminated material classified as hazardous waste at an EPA approved hazardous waste treatment, storage, or disposal facility off Government property.

d. Accumulate waste materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums or appropriately sized container for smaller volumes. Properly label each drum to identify the type of hazardous material (49 CFR 172). For hazardous waste, the collection container requires marking/labeling in accordance with 40 CFR 262 and corresponding state regulations during the accumulation/collection timeframe. The Contracting Officer or an authorized representative will assign an area for accumulation of waste containers. Coordinate authorized accumulation volumes and time limits with the host installation environmental function.

e. Handle, store, transport, and dispose lead or lead contaminated waste in accordance with 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 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 waste with the host installation environmental function. Submit written evidence of TSD approval to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA, State or local regulatory agencies. Submit one copy of the completed hazardous waste manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. 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 containing materials or non-hazardous waste delivered to the treatment or disposal facility.

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
02/19, CHG 6: 11/23

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 (ACI)

ACI 117	(2010; R 2015) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 301	(2020) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting

ASTM INTERNATIONAL (ASTM)

ASTM A934/A934M	(2022) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM C31/C31M	(2024b) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2024) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2024) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78/C78M	(2022) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2024c) Standard Specification for Ready-Mixed Concrete

ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2024) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311/C311M	(2022) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2024) Standard Specification for Chemical Admixtures for Concrete
ASTM C618	(2023; E 2023) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C989/C989M	(2022) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	(2024) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1116/C1116M	(2023) Standard Specification for Fiber-Reinforced Concrete
ASTM C1240	(2020) Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1260	(2021) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1567	(2023) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

ASTM C1602/C1602M	(2022) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C1778	(2016) Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete
ASTM D3042	(2017) Standard Test Method for Insoluble Residue in Carbonate Aggregates
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, slag cement, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, slag cement, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.

e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.

f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.

g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.

h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.

i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for all submittals Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Laboratory Accreditation;

SD-03 Product Data

Formwork Materials

Recycled Aggregate Materials;

Cementitious Materials;

Admixtures

Reinforcing Fibers

Local/Regional Materials;

SD-05 Design Data

Concrete Mix Design;

SD-06 Test Reports

Concrete Mix Design;

Fly Ash

Pozzolan

Slag Cement

Aggregates

Fiber-Reinforced Concrete;

Compressive Strength Tests;

Slump Tests

Water

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until embedded items are in place and ready for concrete placement.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit all documentation required in ACI 301 Section 4 and as specified in this section. Submit a complete list of materials including type; brand; source and amount of cement, supplementary cementitious materials fibers, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. Required average strength can be documented by field experience if field strength test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using materials and conditions similar to those expected for work, and encompassing a period of not less than 45 days. The average of field strength tests shall equal or exceed fcr'. Changes in materials, conditions, and proportions within the test record shall not have been more closely restricted than those for the proposed work. Test records shall not be more than 24 months old. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Test Reports

1.6.2.1 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.6.2.2 Slag Cement

Submit test results in accordance with ASTM C989/C989M for slag cement. Submit test results performed within 6 months of submittal date.

1.6.2.3 Aggregates

Submit test results in accordance with ASTM C33/C33M, or ASTM C330/C330M for lightweight aggregate, and ASTM C1293 or ASTM C1567 as required in the

paragraph titled ALKALI-AGGREGATE REACTION.

1.6.2.4 Fiber-Reinforced Concrete

Test to determine flexural toughness index I5 in accordance with ASTM C1116/C1116M.

1.6.3 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.4 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and ASTM C1260. The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.

b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by ASTM C31/C31M.

c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 SUSTAINABLE DESIGN REQUIREMENTS

1.7.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. Concrete materials may be locally available. Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

a. Form-facing material in contact with concrete must be lumber or plywood,. Submit product information on proposed form-facing materials if different from that specified herein.

2.2 CONCRETE MATERIALS

2.2.1 Cementitious Materials

2.2.1.1 Portland Cement

a. Unless otherwise specified, provide cement that conforms to ASTM C150/C150M Type I.

b. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

c. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. Supplier must certify that no hazardous waste is used in the fuel mix or raw materials. Supplier must certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants are discharged.

d. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.

e. Cementitious materials must be stored and kept dry and free from contaminants.

2.2.1.2 Fly Ash

a. ASTM C618, Class F, except that the maximum allowable loss on ignition must not exceed 3 percent.

b. If fly ash is used it shall range from 15 to 20 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level,it shall not be used. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.2.1.3 Slag Cement

ASTM C989/C989M, Grade 100.

2.2.1.4 Silica Fume

Silica fume must conform to ASTM C1240, including the optional limits on reactivity with cement alkalis. Silica fume may be furnished as a dry, densified material or as slurry. Proper mixing is essential to accomplish proper distribution of the silica fume and avoid agglomerated silica fume which can react with the alkali in the cement resulting in premature and extensive concrete damage. Supervision at the batch plant, finishing, and curing is essential. Provide at the Contractor's expense the services of a manufacturer's technical representative, experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume. This representative must be present on the project prior to and during at least the first 4 days of concrete production and placement using silica fume. A High Range Water Reducing admixture (HRWRA) must be used with silica fume.

2.2.1.5 Other Supplementary Cementitious Materials

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirement for uniformity.

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.

b. The average particle size must not exceed 6 microns.

c. The sum of SiO_2 plus Al_2O_3 plus Fe_2O_3 must be greater than 77 percent.

2.2.2 Water

a. Water or ice must comply with the requirements of ASTM C1602/C1602M.

b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.

c. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

d. Protect mixing water and ice from contamination during storage and delivery.

e. Submit test report showing water complies with ASTM C1602/C1602M.

2.2.3 Aggregate

2.2.3.1 Normal-Weight Aggregate

a. Aggregates must conform to ASTM C33/C33M.

b. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.

c. Provide sand that is at least 50 percent acid insoluble based on ASTM D3042.

d. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.

e. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with ASTM C33/C33M, and ASTM C1293 expansion data not more than 18 months old.

2.2.3.2 Lightweight Aggregate

Lightweight aggregate in accordance with ASTM C330/C330M.

2.2.3.3 Recycled Aggregate Materials

Use a minimum of 25 percent recycled aggregate, depending on local availability and conforming to requirements of the mix design. Submit recycled material request with the aggregate certification submittals and do not use until approved by the Contracting Officer.

2.2.4 Admixtures

a. Chemical admixtures must conform to ASTM C494/C494M.

b. Air-entraining admixtures must conform to ASTM C260/C260M.

c. Chemical admixtures for use in producing flowing concrete must conform to ASTM C1017/C1017M.

d. Do not use calcium chloride admixtures.

e. Use a corrosion-inhibiting admixture for concrete classified under exposure category C1.

f. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.

g. Protect stored admixtures against contamination, evaporation, or damage.

h. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.

i. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.3 MISCELLANEOUS MATERIALS

2.4 CONCRETE MIX DESIGN

2.4.1 Properties and Requirements

a. Use materials and material combinations listed in this section and the contract documents.

b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.

The minimum cementitious material content for concrete used in floors must meet the following requirements:

Nominal maximum size of aggregate, in.	Minimum cementitious material content, pounds per cubic yard
1-1/2	470
1	520
3/4	540
3/8	610

c. Selected target slump must meet the requirements this section, the contract documents, and must not exceed 9 in. Concrete must not show visible signs of segregation.

d. The target slump must be enforced for the duration of the project. Determine the slump by ASTM C143/C143M. Slump tolerances must meet the requirements of ACI 117.

e. Concrete properties and requirements for each portion of the structure are specified in the table below. Refer to the paragraph titled DURABILITY for more details on exposure categories and their requirements.

	Minimum *f'c* psi	Exposure Categories^	Miscellaneous Requirements

	Minimum *f'c* psi	Exposure Categories^	Miscellaneous Requirements
Slabs-on-ground	3000 at 28 days	C1	Min. dosage 4 (pounds per cubic yard) for synthetic macro-fiber

2.4.2 Durability

2.4.2.1 Alkali-Aggregate Reaction

Do not use any aggregate susceptible to alkali-carbonate reaction (ACR). Use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction (ASR):

a. For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 must not exceed 0.04 percent at one year.

b. For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with ASTM C1567 must not exceed 0.10 percent at an age of 16 days.

c. Alkali content in concrete (LBA) must not exceed 4 pounds per cubic yard for moderately reactive aggregate or 3 pounds per cubic yard for highly reactive aggregate. Reactivity must be determined by testing in accordance with ASTM C1293 and categorized in accordance with

ASTM C1778. Alkali content is calculated as follows:
LBA = (cement content, pounds per cubic yard) × (equivalent alkali content of portland cement in percent/100 percent)

2.4.2.2 Freezing and Thawing Resistance

a. Provide concrete meeting the following requirements based on exposure class assigned to members for freezing-and-thawing exposure in Contract Documents:

Exposure class	**Maximum *w/cm****	**Minimum *f'c*, psi**	**Air content**	**Additional Requirements**
F1	0.55	3500	Depends on aggregate size	N/A

2.5 REINFORCEMENT

2.5.1 Reinforcing Fibers

2.5.1.1 Synthetic Fibers

In addition to the requirements specified above, provide fiber reinforced concrete in accordance with ASTM C1116/C1116M Type III, synthetic fiber reinforced concrete, and as follows. Synthetic reinforcing fibers must be monofilament polypropylene fibers, with a minimum of 10 percent post-consumer recycled content, or a minimum of 40 percent post-industrial recycled content.Fibers may contain post-consumer or post-industrial recycled content.

Provide fibers that have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Add fibers at the batch plant.

PART 3 EXECUTION

3.1 EXAMINATION

a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.

b. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

c. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

a. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

b. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

a. When subgrade material is semi-porous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited.

3.2.3 Subgrade Under Slabs on Ground

a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

b. Previously constructed subgrade or fill must be cleaned of foreign materials

c. Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

d. Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

3.3 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1

percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.3.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.3.2 Mixing

a. Mix concrete in accordance with ASTM C94/C94M, ACI 301 and ACI 304R.

b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates. A retarder shall be used to facilitate placing and finishing when concrete temperature is 85 degrees F or greater.

c. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

d. When fibers are used, add fibers together with the aggregates and never as the first component in the mixer. Fibers must be dispensed into the mixing system using appropriate dispensing equipment and procedure as recommended by the manufacturer.

3.3.3 Transporting

Transport concrete from the mixer to placement as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.4 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5. Concrete shall be placed within 15 minutes of discharge into non-agitating equipment.

3.4.1 Cold Weather

Cold weather concrete must meet the requirements of ACI 301 unless otherwise specified. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to the structure while curing. Limit the rate of cooling to 37 degrees F in any one hour and 50 degrees F per 24 hours after heat application.

3.4.2 Hot Weather

Hot weather concrete must meet the requirements of ACI 301 unless otherwise specified. Maintain required concrete temperature using Figure 4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature

and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete.

3.4.3 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.5 SURFACE FINISHES EXCEPT FLOOR AND SLAB FINISHES

3.5.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.5.2 Not Against Forms

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.5.3 Formed Surfaces

3.5.3.1 Tolerances

Tolerances in accordance with ACI 117 and as indicated.

3.5.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.5.4 Smooth-Rubbed Finish

Provide a smooth-rubbed finish per ACI 301 Section 5

3.6 FLOOR AND SLAB FINISHES AND MISCELLANEOUS CONSTRUCTION

In accordance with ACI 301 and ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Steel trowel and fine-broom finish concrete slabs that are to receive quarry tile, ceramic tile, or paver tile. Where straightedge measurements are specified, Contractor must provide straightedge.

3.6.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater. Grate tampers ("jitterbugs") shall not be used.

3.6.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. Finish concrete in accordance with ACI 301 Section 5 for a scratched finish.

3.6.1.2 Concrete Containing Silica Fume

Finish using magnesium floats or darbies. Finish using techniques demonstrated in the sample installation.

3.6.1.3 Steel Troweled

Use for floors intended as walking surfaces, and for reception of floor coverings. Finish concrete in accordance with ACI 301 Section 5 for a steel troweled finish.

3.6.1.4 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.7 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period.

3.7.1 Curing Periods

ACI 301 Section 5. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are

subject to approval by the Contracting Officer.

3.7.2 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed.

3.7.3 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any one hour nor 80 degrees F in any 24-hour period.

3.7.4 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.7.5 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.8 FIELD QUALITY CONTROL

3.8.1 Concrete Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.8.2 Concrete Testing

3.8.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement.

3.8.2.2 Compressive Strength Tests

ASTM C39/C39M. Make nine 4 inch by 8 inch test cylinders for each set of tests in accordance with ASTM C31/C31M, ASTM C172/C172M and applicable

requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test three 4 inch by 8 inch cylinders at 7 days, three 4 inch by 8 inch cylinders at 28 days, and hold three 4 inch by 8 inch cylinders in reserve. Take samples for strength tests for each concrete mixture placed each day not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls. For the entire project, take samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of three 4 inch by 8 inch cylinders from the same concrete sample tested at 28 days. Concrete compressive tests must meet the requirements of this section, the Contract Document, and ACI 301.

3.8.2.3 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

a. Failure to meet compressive strength tests as evaluated.

b. Reinforcement not conforming to requirements specified.

c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.

d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.

e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.

f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.8.2.4 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.8.2.5 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials,

make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

b. Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

d. Strength of cores from each member or area are considered satisfactory if their average compressive strength is equal to or greater than 85 percent of the design compressive strength, and if no single core strength is less than 75 percent of the design compressive strength. Additional testing of cores extracted from locations represented by erratic core strength results will be permitted only when approved by the Contracting Officer.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.9 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.9.1 Crack Repair

Prior to final acceptance, all cracks in excess of 0.02 inches wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.9.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.9.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the

Contracting Officer prior to proceeding.

-- End of Section --

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE CONCRETE (CIVIL WORK)
05/14

PART 1 GENERAL

1.1 SUMMARY

Perform all work in accordance with ACI 318.

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 (ACI)

ACI 117	(2010; R 2015) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 301	(2020) Specifications for Structural Concrete
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 318	(2019; R 2022) Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary (ACI 318R-19)
ACI 347R	(2014; Errata 1 2017) Guide to Formwork for Concrete
ACI SP-66	(2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A615/A615M	(2024) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A1064/A1064M	(2024) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31/C31M	(2024b) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2024) Standard Specification for Concrete Aggregates

ASTM C39/C39M	(2024) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94/C94M	(2024c) Standard Specification for Ready-Mixed Concrete
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2024) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2024a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2024) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C494/C494M	(2024) Standard Specification for Chemical Admixtures for Concrete
ASTM C618	(2023; E 2023) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C685/C685M	(2024) Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C1064/C1064M	(2023) Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1602/C1602M	(2022) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM D75/D75M	(2019) Standard Practice for Sampling Aggregates
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM E96/E96M	(2024) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials

ASTM E1745 (2017; R 2023) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

- Air-Entraining Admixture
- Water-Reducing or Retarding Admixture
- Curing Materials
- Expansion Joint Filler Strips, Premolded
- Conveying and Placing Concrete
- Formwork
- Mix Design Data
- Ready-Mix Concrete
- Mechanical Reinforcing Bar Connectors
- Fly Ash

SD-06 Test Reports

- Aggregates
- Concrete Mixture Proportions
- Compressive Strength Testing
- Slump
- Air Content
- Water

SD-07 Certificates

- Cementitious Materials
- Pozzolan
- Aggregates
- Delivery Tickets

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

The Government retains the option to sample and test 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. Obtain samples of aggregates at the point of batching in accordance with ASTM D75/D75M. Sample concrete in accordance with ASTM C172/C172M. Determine slump and air content in accordance with ASTM C143/C143M and ASTM C231/C231M, respectively, when cylinders are molded. Prepare, cure, and transport compression test specimens in accordance with ASTM C31/C31M. Test compression test specimens in accordance with ASTM C39/C39M. Take samples for strength tests not less than once each shift in which concrete is produced. Provide a minimum of four 6 x 12 inch or six 4 x 8 inch

specimens from each sample; two 6 x 12 inch or three 4 x 8 inch to be tested at 28 days (90 days if pozzolan or slag cement is used) for acceptance. Two 6 x 12 inch or three 4 x 8 inch will be tested at 7 days for information.

2.1.1 Strength

Acceptance test results are the average strengths of two 6 x 12 inch or three 4 x 8 inch specimens tested at 28 days (90 days if pozzolan or slag cement is used). The strength of the concrete is considered satisfactory so long as the average of all three consecutive acceptance test results equal or exceed the specified compressive strength, f'c, and no individual acceptance test result falls below f'c by more than 500 psi.

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 ACI 117.

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 yard 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. The specified compressive strength f'c is 4,000 psi at 28 days (90 days if pozzolan is used). The maximum nominal size coarse aggregate is 3/4 inch, in accordance with ACI 304R. The air content must be between 4.5 and 7.5 percent with a slump between 2 and 5 inches. The maximum water-cementitious material ratio is 0.50. 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". Also, certificates for all material conforming to EPA's Comprehensive Procurement Guidelines (CPG), in accordance with 40 CFR 247. Provide cementitious materials that conform to the appropriate specifications listed:

2.2.1.1 Portland Cement

ASTM C150/C150M, Type I, including false set requirements with tri-calcium aluminates (C3A) content less than 10 percent and a maximum cement-alkali content of 0.80 percent Na2Oe (sodium oxide) equivalent.

2.2.1.2 Pozzolan

Provide pozzolan that conforms to ASTM C618, Class F, including requirements of Tables 1A and 2A.

2.2.2 Aggregates

For fine and coarse aggregates meet the quality and grading requirements of ASTM C33/C33M, Class Designations 4M or better. 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. Retest chemical admixtures that have been in storage at the project site, for longer than 6 months or that have been subjected to freezing, at the expense of the Contractor at the request of the Contracting Officer and will be rejected if test results are not satisfactory.

2.2.3.1 Air-Entraining Admixture

Provide air-entraining admixture that meets the requirements of ASTM C260/C260M.

2.2.3.2 Water-Reducing or Retarding Admixture

Provide water-reducing or retarding admixture meeting the requirements of ASTM C494/C494M, Type A, B, or D.

2.2.4 Water

Mixing and curing water in compliance with the requirements of ASTM C1602/C1602M; free of injurious amounts of oil, acid, salt, or alkali. Submit test report showing water complies with ASTM C1602/C1602M.

2.2.5 Reinforcing Steel

Provide reinforcing bars conforming to the requirements of ASTM A615/A615M, Grade 60, deformed. Provide welded steel wire reinforcement conforming to the requirements of ASTM A1064/A1064M. Detail reinforcement not indicated in accordance with ACI 301 and ACI SP-66. Provide mechanical reinforcing bar connectors in accordance with ACI 301 and provide 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 D1752, Type I.

2.2.7 Formwork

Design and engineer the formwork as well as its construction in accordance with ACI 301 Section 2 and 5 and ACI 347R. Fabricate of wood, steel, or other approved material.

2.2.8 Form Coatings

Provide form coating in accordance with ACI 301.

2.2.9 Vapor Barrier

ASTM E1745 Class A polyethylene sheeting, minimum 10 mil thickness or other equivalent material with a maximum permeance rating of 0.04 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.2.10 Curing Materials

Provide curing materials in accordance with ACI 301, Section 5.

2.3 READY-MIX CONCRETE

Provide ready-mix concrete with mix design data conforming to ACI 301 Part 4. Submit delivery tickets in accordance with ASTM C94/C94M for each ready-mix concrete delivery, include the following additional information: .

a. Type and brand cement

b. Cement content in 94-pound bags per cubic yard of concrete

c. Maximum size of aggregate

d. Amount and brand name of admixture

e. Total water content expressed by water cementitious material ratio

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 snow, ice, 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 2 inches 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 ASTM C94/C94M except as otherwise specified.

3.1.3.2 Concrete Made by Volumetric Batching and Continuous Mixing

Conform to ASTM C685/C685M.

3.2 CONVEYING AND PLACING CONCRETE

Convey and place concrete in accordance with ACI 301, Section 5.

3.2.1 Cold-Weather Requirements

Place concrete in cold weather in accordance with ACI 306R

3.2.2 Hot-Weather Requirements

Place concrete in hot weather in accordance with ACI 305R

3.3 FINISHING

3.3.1 Temperature Requirement

Do not finish or repair concrete when either the concrete or the ambient temperature is below 50 degrees F.

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 1/2 inch 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 so that the final color when cured is the same as adjacent concrete.

3.3.3 Finishing Unformed Surfaces

3.3.3.1 Expansion and Contraction Joints

Provide 1/2 inch thick transverse expansion joints where new work abuts an existing concrete. Provide expansion joints at a maximum spacing of 30 feet on center in sidewalks, unless otherwise indicated. Provide contraction joints at a maximum spacing of 5 linear feet in sidewalks,

unless otherwise indicated. Cut contraction joints at a minimum of 1 inch(es) deep with a jointing tool after the surface has been finished.

3.4 CURING AND PROTECTION

Cure and protect in accordance with ACI 301, Section 5.

3.5 FORM WORK

Provide form work in accordance with ACI 301, Section 2 and Section 5.

3.5.1 Removal of Forms

Remove forms in accordance with ACI 301, Section 2.

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 ACI SP-66. Provide shop details and bending in accordance with ACI 318 and ACI SP-66.

3.6.2 Splicing

Perform splices in accordance with ACI 318 and ACI SP-66.

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. See Section 01 45 00 QUALITY CONTROL.

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 ASTM C172/C172M. Make six test cylinders.

b. Test concrete for compressive strength at 7 and 28 days for each design mix and for every 100 cubic yards of concrete. Test two cylinders at 7 days; two cylinders at 28 days; and hold two cylinders in reserve. Conform test specimens to ASTM C31/C31M. Perform compressive strength testing conforming to ASTM C39/C39M.

c. Test slump at the site of discharge for each design mix in accordance with ASTM C143/C143M. Check slump twice during each shift that concrete is produced for each strength of concrete required.

d. Test air content for air-entrained concrete in accordance with ASTM C231/C231M. Test concrete using lightweight or extremely porous aggregates in accordance with ASTM C173/C173M. Check air content at least twice during each shift that concrete is placed for each strength of concrete required.

e. Determine temperature of concrete at time of placement in accordance with ASTM C1064/C1064M. Check concrete temperature at least twice 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 04 20 00

UNIT MASONRY
11/15, CHG 2: 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 A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A185/A185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A951/A951M	(2011) Standard Specification for Steel Wire for Masonry Joint Reinforcement
ASTM A1064/A1064M	(2024) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C90	(2022) Standard Specification for Loadbearing Concrete Masonry Units
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C270	(2019a; E 2019) Standard Specification for Mortar for Unit Masonry
ASTM C641	(2017) Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregates
ASTM C1384	(2012a) Standard Specification for Admixtures for Masonry Mortars

THE MASONRY SOCIETY (TMS)

TMS MSJC	(2016) Masonry Standard Joint Committee's (MSJC) Book - Building Code Requirements and Specification for Masonry Structures, Containing TMS 402/ACI 530/ASCE 5, TMS 602/ACI 530.1/ASCE 6, and Companion Commentaries

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

SD-03 Product Data

Hot Weather Procedures;

Cold Weather Procedures;

Cementitious Materials;

SD-04 Samples

Concrete Masonry Units (CMU);

Admixtures for Masonry Mortar;

Anchors, Ties, and Bar Positioners;

Joint Reinforcement;

SD-05 Design Data

Masonry Compressive Strength;

SD-07 Certificates

Concrete Masonry Units (CMU)

Cementitious Materials

Admixtures for Masonry Mortar

Anchors, Ties, and Bar Positioners

Joint Reinforcement

SD-08 Manufacturer's Instructions

Admixtures for Masonry Mortar

SD-10 Operation and Maintenance Data

SD-11 Closeout Submittals

Recycled Content of Cement; S

1.3 QUALITY ASSURANCE

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver, store, handle, and protect material to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.4.1 Masonry Units

Cover and protect masonry units from precipitation. Conform to handling and storage requirements of TMS MSJC.

1.4.2 Anchors, and Ties

Store scoated anchors, ties, and joint reinforcement above the ground. Maintain steel reinforcing bars and uncoated ties free of loose mill scale and loose rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Deliver cementitious and other packaged materials in unopened containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious material in dry, weathertight enclosures or completely cover. Handle cementitious materials in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination and segregation.

1.5 PROJECT/SITE CONDITIONS

Conform to TMS MSJC for hot and cold weather masonry erection.

1.5.1 Hot Weather Procedures

When ambient air temperature exceeds 100 degrees F, or exceeds 90 degrees F and the wind velocity is greater than 8 mph, comply with TMS MSJC Article 1.8 D for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

1.5.2 Cold Weather Procedures

When ambient temperature is below 40 degrees F, comply with TMS MSJC Article 1.8 C for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design - Specified Compressive Strength of Masonry

The specified compressive strength of masonry, f'm, is 2,000 PSI.

2.1.2 Performance - Verify Masonry Compressive Strength

Verify specified compressive strength of masonry using the "Unit Strength

Method" of TMS MSJC. Submit calculations and certifications of unit and mortar strength.

2.2 MANUFACTURED UNITS

2.2.1 General Requirements

Do not change the source of materials, which will affect the appearance of the finished work, after the work has started except with Contracting Officer's approval. Submit test reports from an approved independent laboratory. Certify test reports on a previously tested material as the same materials as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

2.2.2 Concrete Units

2.2.2.1 Aggregates

Test lightweight aggregates, and blends of lightweight and heavier aggregates in proportions used in producing the units, for stain-producing iron compounds in accordance with ASTM C641,visual classification method. Do not incorporate aggregates for which the iron stain deposited on the filter paper exceeds the "light stain" classification.

Use industrial waste by-products (air-cooled slag, cinders, or bottom ash), ground waste glass and concrete, granulated slag, and expanded slag in aggregates.

2.2.2.2 Concrete Masonry Units (CMU)

2.2.2.2.1 Recycled Content

Provide units with a minimum of 10 percent post-consumer recycled content, or a minimum of 40 percent post-industrial recycled content, based on mass, cost, or volume.

2.2.2.2.2 Size

Provide units with specified dimension of 7.625 inches wide, 7.625 inches high, and 15.625 inches long. Provide standard widths and shapes ranging from nominal 4 inch to 1 foot, 0 inch wythe units. Furnish bullnose, corner, double corner, sill, cap and header units. Units must have a regular, consistent texture.

2.2.2.2.3 Surfaces

Provide units with exposed surfaces that are smooth and of uniform texture.

2.2.2.2.4 Unit Types

a. Hollow Load-Bearing Units: ASTM C90, lightweight . Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

b. Solid Load-Bearing Units: ASTM C90, lightweight or normal weight units. Provide solid units as indicated.

2.3 MATERIALS

2.3.1 Mortar Materials

2.3.1.1 Cementitious Materials

Provide cementitious materials that conform to those permitted by ASTM C270.

2.3.1.2 Hydrated Lime and Alternates

Provide lime that conforms to one of the materials permitted by ASTM C207 for use in combination with portland cement, hydraulic cement, and blended hydraulic cement. Do not use lime in combination with masonry cement or mortar cement.

2.3.1.3 Admixtures for Masonry Mortar

In cold weather, use a non-chloride based accelerating admixture that conforms to ASTM C1384, unless Type III portland cement is used in the mortar.

2.3.1.4 Aggregate and Water

Provide aggregate (sand) and water that conform to materials permitted by ASTM C270.

2.4 MORTAR

2.4.1 Mortar Mix

a. Provide mortar Type S unless specified otherwise herein. Do not use masonry cement in the mortar. Do not use air-entrainment in the mortar.

b. For field-batched mortar, measure component materials by volume. Use measuring boxes for materials that do not come in packages, such as sand, for consistent batching. Mix cementitious materials and aggregates between 3 and 5 minutes in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency. Do not hand mix mortar unless approved by the Contracting Officer. Maintain workability of mortar by remixing or retempering. Discard mortar that has begun to stiffen or is not used within 2-1/2 hours after initial mixing.

c. For preblended mortar, follow manufacturer's mixing instructions.

2.5 ACCESSORIES

2.5.1 Anchors, Ties, and Bar Positioners

2.5.1.1 General

a. Fabricate anchors and ties without drips or crimps. Size anchors and ties to provide a minimum of 5/8 inch mortar cover from each face of masonry.

b. Fabricate steel wire anchors and ties shall from wire conforming to ASTM A1064/A1064M and hot-dip galvanize in accordance with ASTM A153/A153M.

c. Fabricate joint reinforcement in conformance with ASTM A951/A951M. Hot dip galvanize joint reinforcement in exterior walls and in interior walls exposed to moist environment in conformance with ASTM A153/A153M. Galvanize joint reinforcement in other interior walls in conformance with ASTM A641/A641M; coordinate with paragraph JOINT REINFORCEMENT below.

2.5.1.2 Wire Mesh Anchors

Provide wire mesh anchors of 1/4 inch mesh galvanized hardware cloth, conforming to ASTM A185/A185M, with length not less than 12 inches, at intersections of interior non-bearing masonry walls.

2.5.2 Joint Reinforcement

Factory fabricate joint reinforcement in conformance with ASTM A951/A951M, welded construction. Provide ladder type joint reinforcement, having one longitudinal wire in the mortar bed of each face shell for hollow units with all wires a minimum of 9 gauge. Size joint reinforcement to provide a minimum of 5/8 inch cover from each face. Space crosswires not more than 16 inches. Provide joint reinforcement for straight runs in flat sections not less than 10 feet long. Provide joint reinforcement with factory formed corners and intersections. Submit one piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to start of work, verify the applicable conditions as set forth in TMS MSJC, inspection.

3.2 PREPARATION

3.2.1 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

3.2.2 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed.

3.2.3 Concrete Surfaces

Where masonry is to be placed, clean concrete of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least 1/8 inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

3.3 ERECTION

3.3.1 General

a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Lay masonry units in running bond pattern unless indicated otherwise. Lay facing courses level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances is plus or minus 1/2 inch. Adjust each unit to its final position while mortar is still soft and has plastic consistency.

b. Remove and clean units that have been disturbed after the mortar has stiffened, and relay with fresh mortar. Select units to be used in exposed masonry surfaces from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work.

c. When necessary to temporarily discontinue the work, step (rack) back the masonry for joining when work resumes. Toothing may be used only when specifically approved by the Contracting Officer. Before resuming work, remove loose mortar and thoroughly clean the exposed joint.

d. Ensure that units being laid and surfaces to receive units are free of water film and frost. Lay solid units in a nonfurrowed full bed of mortar. Shove units into place so that the vertical joints are tight. Place hollow units so that mortar extends to the depth of the face shell at heads and beds, unless otherwise indicated.

3.3.1.1 Jointing

Tool mortar joints when the mortar is thumbprint hard. Tool horizontal joints after tooling vertical joints. Brush mortar joints to remove loose and excess mortar.

3.3.1.1.1 Tooled Joints

Tool mortar joints in exposed masonry surfaces concave, using a jointer that is slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar joint. No exposed joints are to be left un-tooled.

3.3.1.1.2 Joint Widths

a. Provide 3/8 inch wide mortar joints in concrete masonry.

b. Maintain mortar joint widths within tolerances permitted by TMS MSJC

3.3.1.2 Cutting and Fitting

Use full units of the proper size wherever possible, in lieu of cut units. Locate cut units where they would have the least impact on the architectural aesthetic goals of the facility. Perform cutting and fitting, including that required to accommodate the work of others, by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Before being placed in the work, dry wet-cut units to the

same surface-dry appearance as uncut units being laid in the wall. Provide cut edges that are clean, true and sharp.

a. Carefully make openings in the masonry so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Provide reinforced masonry lintels above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

b. Do not reduce masonry units in size by more than one-third in height and one-half in length. Do not locate cut products at ends of walls, corners, and other openings.

3.3.1.3 Unfinished Work

Rack back unfinished work for joining with new work. Toothing may be resorted to only when specifically approved by the Contracting Officer. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

3.3.2 ANCHORAGE

3.3.2.1 Anchorage at Intersecting Walls

Provide wire mesh anchors at maximum 16 inches spacing at intersections of interior non-bearing masonry walls.

Anchor structural masonry walls with horizontal joint reinforcement spaced no more than 1 foot, 4 inches on center, unless the drawings indicate a movement joint at the intersection.

3.4 APPLICATION

3.4.1 Interface with Other Products

3.4.1.1 Built-In Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed ties and joint reinforcement in the mortar.

3.4.2 Tolerances

Lay masonry plumb, true to line, with courses level within the tolerances of TMS MSJC, Article 3.3 F.

3.5 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar daubs and splashings from masonry-unit surfaces that will be exposed. Before completion of the work, rake out defects in joints of masonry to be exposed, fill with mortar, and tool to match existing joints. Do not clean masonry surfaces, other than removing excess surface mortar, until mortar in joints has hardened. Leave masonry surfaces clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints

throughout. Do not use metal tools and metal brushes for cleaning.

3.5.1 Dry-Brushing Concrete Masonry

Dry brush exposed concrete masonry surfaces at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.6 PROTECTION

Protect facing materials against staining. Before starting or resuming work, clean top surface of masonry in place of loose mortar and foreign material.

-- End of Section --

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SECTION 05 40 00

COLD-FORMED METAL FRAMING
05/15, 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 IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S110	(2007; Suppl 1; Reaffirmed 2012) Standard for Seismic Design of Cold-Formed Steel Structural Systems - Special Bolted Moment Frames
AISI S200	(2007) North American Standard for Cold-Formed Steel Framing - General Provision
AISI S201	(2007) North American Standard for Cold-Formed Steel Framing - Product Data
AISI S202	(2011) Code of Standard Practice for Cold-formed Steel Structural Framing
AISI S213	(2007; Suppl 1 2009) North American Standard for Cold-Formed Steel Framing - Lateral Design

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60

	000 PSI Tensile Strength
ASTM A370	(2021) Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1003/A1003M	(2015) Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM C955	(2017) Standard Specification for Cold-Formed Steel Structural Framing Members
ASTM C1007	(2020) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM E329	(2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F2329/F2329M	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2023; with Change 2, 2024) Structural Engineering

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components

SD-03 Product Data

Steel Studs, Joists, Tracks, Bracing, Bridging and Accessories

Recycled Content of Steel Products

SD-05 Design Data

Metal Framing Calculations

SD-07 Certificates

Load-Bearing Cold-Formed Metal Framing

Welds

1.3 DELIVERY, STORAGE, AND HANDLING

Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Provide structural metal framing for exterior door canopies.

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with AISI S100.

Submit mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

1.5 MAXIMUM DEFLECTION

Deflections of structural members shall not exceed the more restrictive of the limitations of ICC IBC and UFC 3-301-01.

1.6 QUALITY ASSURANCE

a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a registered professional engineer.

b. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 for testing indicated.

c. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements,

including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

d. Welding Qualifications: Qualify procedures and personnel according to the following:

(1) AWS D1.1/D1.1M, "Structural Welding Code - Steel".

(2) AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel".

e. AISI Specifications and Standards: Comply with:

(1) AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members".

(2) AISI S110, "Standard for Seismic Design of Cold-Formed Steel Structural Systems - Special Bolted Moment Frames".

(3) AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provision".

(4) AISI S201, "North American Standard for Cold-Formed Steel Framing - Product Data".

(5) AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

(6) AISI S213, "North American Standard for Cold-Formed Steel Framing - Lateral Design".

1.6.1 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories including the following:

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

1.6.2 Design Data Required

Submit metal framing calculations with design criteria and structural loading to verify sizes, thickness, and spacing of members and connections signed and sealed by a registered professional engineer. Show methods and practices used in installation.

1.6.2.1 Canopy Framing

Furnish structural metal framing systems that resist dead, live, uplift and lateral loads. Marine Corps Air Station Cherry Point must resist a 139 mile per hour, ultimate design wind speed, 50 PSF, Risk Category II, Surface Roughness Category C, Exposure Category C lateral load. Comply with UFC 3-301-01 and ASCE 7 as applicable for building system designs and

components. Assembly design responsibility is delegated to the Contractor and incorporates specific properties and structural capabilities of selected products and manufacturers.

Supplement delegated design shop drawings with metal framing system structural computations. Tie general manufacturer data of appurtenant members utilized to project specific conditions. Specify fastening patterns and connections.

PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

a. Provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.

b. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

   (1) Grade: As required by structural performance.

   (2) Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).

c. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

   (1) Minimum Base-Metal Thickness: 0.0329 inch.

   (2) Flange Width: 1-5/8 inches.

d. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

   (1) Minimum Base-Metal Thickness: 0.0329 inch.

   (2) Flange Width: 1-1/4 inches .

2.1.1 Studs and Joists of 54 mils (0.054 Inch) and Heavier

Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS Grade 50, G60 .

2.1.2 Studs and Joists of 43 mils (0.043 Inch) and Lighter

Studs and Joists of 43 mils (0.043 Inch) and Lighter, Track, and Accessories (All thicknesses): Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS, Grade 33 33,000 psi G60.

2.1.3 Sizes, Thickness, Section Modulus, and Other Structural Properties

Size and thickness as required.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the

member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

a. An ICC number.

b. Manufacturer's identification.

c. Minimum delivered uncoated steel thickness.

d. Protective coating designator.

e. Minimum yield strength.

2.3 CONNECTIONS

2.3.1 Steel-To-Steel Connections

a. Screws: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel screws of the type and size indicated. Provide low-profile head beneath sheathing and manufacturer's standard elsewhere. Electroplated to a minimum of 5 micron zinc coating per ASTM F1941 or hot-dipped galvanized per ASTM A123/A123M or ASTM A153/A153M.

b. Bolts: ASTM A307 coated by hot-dip process per ASTM F2329/F2329M or zinc-coated by mechanical-deposition process per ASTM B695, Class 55.

c. Welding Electrodes: Comply with AWS standards.

PART 3 EXECUTION

3.1 TRUSS FABRICATION

a. Fabricate cold-formed steel plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

3.2 FASTENING

Fasten framing members together by welding or by using self-drilling, self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.2.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI S100. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. Submit certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 43 mils.

3.2.2 Screws

Screws shall be of the self-drilling self-tapping type, size, and location as required. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for

screws shall be as specified in AISI S100. Screws covered by sheathing materials shall have low profile heads.

3.2.3 Anchors

Anchors shall be of the type, size, and location as required for substrates encountered.

3.3 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

3.3.1 Tracks

Provide accurately aligned runners at top and bottom of studs. Install sealer gasket under bottom of track on concrete slab or foundation. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.3.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and AISI S100. Bracing shall be not less than the following:

LOAD	HEIGHT	BRACING
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet	Two rows at 1/3 points
	Over 10 feet	Rows 3'-4" o.c. maximum

-- End of Section --

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SECTION 06 41 16.00 10

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS
08/10, CHG 1: 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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A161.2	(1998) Decorative Laminate Countertops, Performance Standards for Fabricated High Pressure

ASTM INTERNATIONAL (ASTM)

ASTM F547	(2022) 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 A208.2	(2016) Medium Density Fiberboard (MDF) for Interior Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1	(2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework cabinets and vanity aprons as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. All exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule, must be sanded smooth and must receive a clear finish of polyurethane. Wood finish may be shop finished or field applied in accordance with Section 09 90 00 PAINTS AND COATINGS.

1.3 SUSTAINABILITY REPORTING

See Section 01 33 29 SUSTAINABILITY REPORTING for project sustainablility information.

1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings

Installation

SD-03 Product Data

Wood Materials

Finish Schedule

SD-04 Samples

Plastic Laminates

Cabinet Hardware

SD-07 Certificates

Quality Assurance

Laminate Clad Casework

Certification

1.5 QUALITY ASSURANCE

1.5.1 General Requirements

Unless otherwise noted on the drawings, all materials, construction methods, and fabrication must conform to and comply with the custom grade quality standards as outlined in NAAWS 3.1, Section for laminate clad cabinets. These standards must apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work must be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and

specified. Submit a quality control statement which illustrates compliance with and understanding of NAAWS 3.1 requirements, in general, and the specific NAAWS 3.1 requirements provided in this specification. The quality control statement must also certify a minimum of ten years Contractor's experience in laminate clad casework fabrication and construction. The quality control statement must provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

1.5.2 Sustainable Design Certification

Product must be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and must be current.

1.6 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area must be well ventilated and not subject to extreme changes in temperature or humidity.

1.7 SEQUENCING AND SCHEDULING

Coordinate work with other trades. Units must not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets must be installed before finished flooring materials are installed.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

2.1.1 Lumber

a. All framing lumber must be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, must be nominal 3/4 inch hardwood.

b. Standing or running trim casework components, which are specified to receive a transparent finish, must be maple hardwood species, plain sawn. AWI grade must be custom. Location, shape, and dimensions must be as indicated on the drawings.

2.1.2 Panel Products

2.1.2.1 Plywood

All plywood panels used for framing purposes must be veneer core hardwood plywood, NAAWS 3.1 Grade AA. Nominal thickness of plywood panels must be as indicated in this specification and on the drawings.

2.1.2.2 Medium Density Fiberboard

Medium density fiberboard (MDF) must be an acceptable panel substrate where noted on the drawings. Medium density fiberboard must meet the minimum standards listed in CPA A208.2.

2.2 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

All plastic laminates must meet the requirements of ANSI/NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Design, colors, surface finish and texture, and locations must be as indicated on the drawings. Submit two samples of each plastic laminate pattern and color. Samples must be a minimum of 5 by 7 inches in size. Plastic laminate types and nominal minimum thicknesses for casework components must be as indicated in the following paragraphs.

2.2.1 Horizontal General Purpose Standard (HGS) Grade

Horizontal general purpose standard grade plastic laminate must be 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

2.2.2 Vertical General Purpose Standard (VGS) Grade

Vertical general purpose standard grade plastic laminate must be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

2.2.3 Cabinet Liner Standard (CLS) Grade

Cabinet liner standard grade plastic laminate must be 0.020 inches in thickness. This laminate grade is intended for light duty semi-exposed interior surfaces of casework components.

2.2.4 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness must be 0.020 inches. Backing sheets must be provided for all laminated casework components where plastic laminate finish is applied to only one surface of the component substrate.

2.3 EDGE BANDING

Edge banding for casework doors and drawer fronts must be PVC vinyl and must be 0.020 inch thick. Material width must be as indicated on the drawings. Color and pattern must match exposed door and drawer front laminate pattern and color.

2.4 CABINET HARDWARE

Submit one sample of each cabinet hardware item specified to include hinges, pulls, and drawer glides. Cabinet pulls must comply with ABA guidelines. All hardware must conform to ANSI/BHMA A156.9, unless otherwise noted, and must consist of the following components:

2.4.1 Door Hinges

Concealed european hinge type.

2.4.2 Cabinet Pulls

ABA standard U-shaped type pull, BHMA No. B02011.

2.4.3 Drawer Slide

Side mounted type with full extension ball bearing and a minimum 75 pound load capacity. Slides must include a positive stop to avoid accidental drawer removal.

2.4.4 Adjustable Shelf Support System

Recessed mortise mounted metal standards, BHMA No. B04071. Support clips for the standards must be closed type, BHMA no. B04081.

2.5 FASTENERS

Nails, screws, and other suitable fasteners must be the size and type best suited for the purpose and must conform to ASTM F547 where applicable.

2.6 ADHESIVES, CAULKS, AND SEALANTS

2.6.1 Adhesives

Adhesives must be of a formula and type recommended by AWI. Adhesives must be selected for their ability to provide a durable, permanent bond and must take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives must meet local regulations regarding VOC emissions and off-gassing.

2.6.1.1 Wood Joinery

Adhesives used to bond wood members must be a Type II for interior use urea-formaldehyde resin formula. Adhesives must withstand a bond test as described in ANSI/WDMA I.S.1A.

2.6.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood must be adhesive consistent with AWI and laminate manufacturer's recommendations. PVC edgebanding must be adhered using a polymer-based hot melt glue.

2.6.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces must be clear, 100 percent silicone.

2.6.3 Sealant

Sealant must be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

2.7 FABRICATION

Verify field measurements as indicated in the shop drawings before fabrication. Fabrication and assembly of components must be accomplished at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components must meet or exceed the requirements for AWI custom grade unless otherwise indicated in this

specification. Cabinet style, in accordance with NAAWS 3.1, Section 400-G descriptions, must be as indicated on the drawings.

2.7.1 Base and Wall Cabinet Case Body

2.7.1.1 Cabinet Components

Frame members must be glued-together, kiln-dried hardwood lumber. Top corners, bottom corners, and cabinet bottoms must be braced with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Cabinet components must be constructed from the following materials and thicknesses:

2.7.1.1.1 Body Members (Ends, Divisions, Bottoms, and Tops)

3/4 inch Plywood panel product

2.7.1.1.2 Face Frames and Rails

3/4 inch panel product

2.7.1.1.3 Shelving

3/4 inch Plywood panel product

2.7.1.1.4 Cabinet Backs

1/4 inch plywood panel product

2.7.1.1.5 Drawer Sides, Backs, and Subfronts

1/2 inch panel product

2.7.1.1.6 Drawer Bottoms

1/4 inch plywood panel product

2.7.1.1.7 Door and Drawer Fronts

3/4-inchplywood panel product

2.7.1.2 Joinery Method for Case Body Members

2.7.1.2.1 Tops, Exposed Ends, and Bottoms

a. Steel "European" assembly screws (1-1/2 inch from end, 5 inch on center, fasteners will not be visible on exposed parts).

b. Doweled, glued under pressure (approx. 4 dowels per 12 inches of joint).

c. Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

d. Spline or biscuit, glued under pressure.

2.7.1.2.2 Exposed End Corner and Face Frame Attachment

2.7.1.2.2.1 Mitered Joint

lock miter or spline or biscuit, glued under pressure (no visible fasteners)

2.7.1.2.2.2 Non-Mitered Joint (90 degree)

butt joint glued under pressure (no visible fasteners)

2.7.1.2.3 Cabinet Backs (Wall Hung Cabinets)

Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Fabrication method must be:

2.7.1.2.3.1 Full Bound

Full bound, captured in grooves on cabinet sides, top, and bottom. Cabinet backs for floor standing cabinets must be side bound, captured in grooves; glued and fastened to top and bottom.

2.7.1.2.3.2 Full Overlay

Full overlay, plant-on backs with minimum back thickness of 1/2 inch and minimum No. 12 plated (no case hardened) screws spaced a minimum 3 inches on center. Edge of back must not be exposed on finished sides. Anchor strips are not required when so attached.

2.7.1.2.4 Cabinet Backs (Floor Standing Cabinets)

2.7.1.2.4.1 Full Overlay

Full overlay, plant-on backs with minimum back thickness of 1/2 inch and minimum No. 12 plated (no case hardened) screws spaced a minimum 3 inches on center. Edge of back must not be exposed on finished sides. Anchor strips are not required when so attached.

2.7.1.2.5 Wall Anchor Strips

Wall Anchor Strips must be required for all cabinets with backs less than 1/2 inch thick. Strips must consist of minimum 1/2 inch thick lumber, minimum 2-1/2 inches width; securely attached to wall side of cabinet back - top and bottom for wall hung cabinets, top only for floor standing cabinets.

2.7.2 Cabinet Floor Base

Floor cabinets must be mounted on a base constructed of 3/4 inch veneer core marine grade or salt-treated plywood. Base assembly components must be a moisture-resistant panel product. Finished height for each cabinet base must be as indicated on the drawings. Bottom edge of the cabinet door or drawer face must be flush with top of base.

2.7.3 Cabinet Door and Drawer Fronts

Door and drawer fronts must be fabricated from 3/4 inch medium density

fiberboard (MDF). All door and drawer front edges must be surfaced with PVC edgebanding, color and pattern as indicated on the drawings.

2.7.4 Drawer Assembly

2.7.4.1 Drawer Components

Drawer components must consist of a removable drawer front, sides, backs, and bottom. Drawer components must be constructed of the following materials and thicknesses:

2.7.4.1.1 Drawer Sides and Backs For Transparent Finish

1/2 inch thick 7-ply hardwood veneer core plywood (no voids), any species

2.7.4.1.2 Drawer Sides and Backs For Laminate Finish

1/2 inch thick 7-ply hardwood veneer core substrate

2.7.4.1.3 Drawer Bottom

1/4 inch thick plywood panel product for transparent or plastic laminate finish

2.7.4.2 Drawer Assembly Joinery Method

a. Multiple dovetail (all corners) or French dovetail front/dadoed back, glued under pressure.

b. Doweled, glued under pressure.

c. Lock shoulder, glued and pin nailed.

d. Bottoms must be set into sides, front, and back, 1/4 inch deep groove with a minimum 3/8 inch standing shoulder.

2.7.5 Shelving

2.7.5.1 General Requirements

Shelving must be fabricated from 3/4 inch veneer core plywood. All shelving top and bottom surfaces must be finished with HPDL plastic laminate. Shelf edges must be finished in a HPDL plastic laminate.

2.7.5.2 Shelf Support System

The shelf support system must be one of the following:

2.7.5.2.1 Recessed (Mortised) Metal Shelf Standards

Mortise standards flush with the finishes surface of the cabinet interior side walls, two per side. Position and space standards on the side walls to provide a stable shelf surface that eliminates tipping when shelf front is weighted. Install and adjust standards vertically to provide a level, stable shelf surface when clips are in place.

2.7.5.2.2 Pin Hole Method

Drill holes on the interior surface of the cabinet side walls. Evenly

space holes in two vertical columns Space the holes in each column at 1 inch increments starting 6 inches from the cabinet interior bottom and extending to within 6 inches of the top interior surface of the cabinet. Drill holes to provide a level, stable surface when the shelf is resting on the shelf pins. Coordinate hole diameter with pin insert size to provide a firm, tight fit.

2.7.6 Laminate Application

Laminate application to substrates must follow the recommended procedures and instructions of the laminate manufacturer and ANSI/NEMA LD 3, using tools and devices specifically designed for laminate fabrication and application. Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. All laminate edges must be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing must be such that no overlap of the member eased is visible. Fabrication must conform to ANSI A161.2. Laminate types and grades for component surfaces must be as follows unless otherwise indicated on the drawings:

2.7.6.1 Base/Wall Cabinet Case Body

a. Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.

b. Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: HPDL Grade CLS.

2.7.6.2 Adjustable Shelving

2.7.6.2.1 Top and Bottom Surfaces

HPDL Grade HGS

2.7.6.2.2 All Edges

HPDL Grade HGS

2.7.6.3 Fixed Shelving

2.7.6.3.1 Top and Bottom Surfaces

HPDL Grade HGS

2.7.6.3.2 Exposed Edges

HPDL Grade HGS

2.7.6.4 Door, Drawer Fronts, Access Panels

2.7.6.4.1 Exterior (Exposed) and Interior (Semi-Exposed) Faces

HPDL Grade VGS

2.7.6.4.2 Edges

HPDL Grade HGS

2.7.6.5 Drawer Assembly

All interior and exterior surfaces: HPDL.

2.7.6.6 Tolerances

Flushness, flatness, and joint tolerances of laminated surfaces must meet the NAAWS 3.1 custom grade requirements.

2.7.7 Finishing

2.7.7.1 Filling

No fasteners must be exposed on laminated surfaces. All nails, screws, and other fasteners in non-laminated cabinet components must be countersunk and the holes filled with wood filler consistent in color with the wood species.

2.7.7.2 Sanding

All surfaces requiring coatings must be prepared by sanding with a grit and in a manner that scratches will not show in the final system.

2.7.7.3 Coatings

Types, method of application and location of casework finishes must be in accordance with the finish schedule, drawings and Section 09 90 00 PAINTS AND COATINGS. All cabinet reveals must be painted. Submit descriptive data which provides narrative written verification of all types of construction materials and finishes, methods of construction, etc. not clearly illustrated on the submitted shop drawings. Data must provide written verification of conformance with NAAWS 3.1 for the quality indicated to include materials, tolerances, and types of construction. Both the manufacturer of materials and the fabricator must submit available literature which describes recycled product content, operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

PART 3 EXECUTION

3.1 INSTALLATION

Installation must comply with applicable requirements for NAAWS 3.1 custom quality standards. Countertops and fabricated assemblies must be installed level, plumb, and true to line, in locations shown on the drawings. Cabinets and other laminate clad casework assemblies must be attached and anchored securely to the floor and walls with mechanical fasteners that are appropriate for the wall and floor construction.

3.1.1 Anchoring Systems

3.1.1.1 Floor

Base cabinets must utilize a floor anchoring system as detailed on the drawings. Anchoring and mechanical fasteners must not be visible from the finished side of the casework assembly. Cabinet assemblies must be attached to anchored bases without visible fasteners as indicated in the drawings. Where assembly abuts a wall surface, anchoring must include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

3.1.1.2 Wall

Cabinet and vanity apron to be wall mounted must utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width; securely attached to the wall side of the cabinet back, both top and bottom.

3.1.2 Hardware

Casework hardware must be installed in types and locations as indicated on the drawings. Where fully concealed European-style hinges are specified to be used with fiberboard doors, the use of plastic or synthetic insertion dowels must be used to receive 3/16 inch "Euroscrews". The use of wood screws without insertion dowels is prohibited.

3.1.3 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels must be accomplished within target fitting tolerances for gaps and flushness in accordance with NAAWS 3.1 custom grade requirements.

3.1.4 Plumbing Fixtures

Install sinks, sink hardware, and other plumbing fixtures in locations as indicated on the drawings and in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

-- End of Section --

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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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z124	Plastic Plumbing Fixtures

ASTM INTERNATIONAL (ASTM)

ASTM D790	(2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D785	(2015) Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E228	(2022) Standard Test Method for Linear Thermal Expansion of Solid Materials with a Push-Rod Dilatometer
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	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CSA GROUP (CSA)

CSA B45.5-11/IAPMO Z124	(2011; Update 1 2012) Plastic Plumbing Fixtures - First Edition

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2024) Life Safety Code

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk	(2017) Handbook for Ceramic, Glass, and Stone Tile Installation

UNDERWRITERS LABORATORIES (UL)

UL 2824	(2020) GREENGUARD Certification Program Method for Measuring Microbial Resistance From Various Sources Using Static Environmental Chambers

1.2 SYSTEM DESCRIPTION

a. Work under this section includes solid polymer (solid surfacing) countertop fabrication as shown 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 polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer 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, countertops, shelving, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer.

c. Appropriate staging areas for solid polymer fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUBMITTALS

Government approval is required for all submittals.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

Installation

SD-03 Product Data

Solid Polymer Material

Qualifications

Fabrications

Indoor air quality for solid surface seam and sealant products

SD-04 Samples

Material

Counter and Vanity Tops

Shower Wall Panel System

SD-06 Test Reports

Solid Polymer Material

SD-07 Certificates

Fabrications

Qualifications

Indoor Air Quality for solid surface fabrication products

SD-10 Operation and Maintenance Data

Clean-up

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

To ensure warranty coverage, solid polymer fabricators must be certified to fabricate by the solid polymer material manufacturer being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Fabricators must have a minimum of 5 years of experience working with solid polymer materials. Submit solid polymer manufacturer's certification attesting to fabricator qualification approval.

1.4.2 Mock-ups

Submit Detail Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent 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 with adequate precautions taken 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 of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat. Provide warranty for material and labor for replacement or repair of defective material for a period of ten years after component installation.

PART 2 PRODUCTS

2.1 MATERIAL

Provide solid polymer material that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting CSA B45.5-11/IAPMO Z124 requirements. Provide materials with the minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch must be repairable by sanding or polishing. Provide material thickness as indicated on the drawings. Provide material not less than 1/4 inch in thickness. Submit a minimum 4 by 4 inch sample of each color and pattern for approval. Provide samples that indicate the full range of color and pattern variation. Retain approved samples as the standard for this work throughout the construction duration. Submit test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements. 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.

2.1.1 Solid Surfacing Material

Provide cast, non-pororus, 100 percent acrylic solid polymer material composed of acrylic polymer, mineral fillers, and pigments and meeting the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	6000 psi (max.)	ASTM D638
Hardness	>85-Rockwell "M" scale(min.)	ASTM D785
Thermal Expansion	.000022 in/in/F (max.)	ASTM E228
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
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
1/2 inch sheet	144 inches, 1/2 lb ball, no failure	
Fungi and Bacteria	No growth	ASTM G21
Microbial Resistance	No growth	UL 2824
Flammability		ASTM E84
Flame Spread	<25	
Smoke Developed	<25	
Class	A	NFPA 101

2.1.2 Material Patterns and Colors

Provide patterns and colors for all solid polymer components and fabrications indicated on the project drawings. Pattern and color must be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

2.1.3 Surface Finish

Provide exposed finished surfaces and edges with a uniform appearance. Exposed surface finish must be matte; gloss rating of 5-20 for lighter colored solid surfacing and semi-gloss; gloss rating of 25-50 for darker colored solid surfacingas indicated on the drawings.

2.2 ACCESSORY PRODUCTS

Provide accessory products, as specified below, manufactured by the solid polymer manufacturer or products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

2.2.1 Seam Adhesive

Provide a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive must be approved by the solid polymer manufacturer and color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. Provide clear or color matched seam adhesive where particulate patterned, solid polymer materials are being bonded together.

2.2.2 Panel Adhesive

Provide neoprene based panel adhesive meeting TCNA Hdbk, Underwriter's

Laboratories (UL) listed. Use this adhesive to bond solid polymer components to adjacent and underlying substrates.

2.2.3 Silicone Sealant

Provide a mildew-resistant, FDA and OSHA Nationally Recognized Testing Laboratory (NRTL) listed silicone sealant or caulk in a clear formulation. The silicone sealant must be approved for use by the solid polymer manufacturer. Use sealant to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

2.2.4 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.

2.2.5 Conductive Tape

Provide manufacturer's standard conductive foil tape, 4 mils thick, applied around the edges of cut outs containing hot or cold appliances.

2.2.6 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 fabricated 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 polymer, joint adhesive, sealants, and heat reflective tape.

2.3.1 Joints and Seams

Form joints and seams between solid polymer components using manufacturer's approved seam adhesive. Provide inconspicuous joints in appearance and 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 and Vanity Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material must be 4 inches high in conformance with dimensions and shapes as indicated on the drawings. Provide backsplashes and end splashes for all counter tops and vanity tops at locations indicated on the drawings. Provide shop fabricated permanently attached backsplashes. Integral backsplashes must be used on counters with sinks.

2.3.3.1 Permanently Attached Backsplash

Fasten permanently attached backsplashes with seam adhesive and to form a radiused coved transition from countertop to backsplash.

2.3.3.2 End Splashes

Provide end splashes as loose for installation at the jobsite after horizontal surfaces to which they must be attached have been installed.

2.3.4 Window Stools

Fabricate window stools from 1/2 inch thick solid surfacing, solid polymer material, including dimensions, edge shape, and other details as indicated on the drawings.

2.3.5 Counter and Vanity Tops

Fabricate all solid surfacing, solid polymer counter top and vanity top components from 1/2 inch thick material including details, dimensions, locations, and quantities as indicated on the Drawings. Provide complete counter tops with 4 inch high permanently attached with coved transition backsplash and loose endsplashes where indicated on the drawings. Attach 2 inch wide reinforcing strip of polymer material under each horizontal counter top seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings. The sample must include the edge profile and backsplash as detailed on the project drawings. Provide solid polymer material of a pattern and color as indicated on the drawings. Provide sample that includes at least one seam and retain approved sample as standard for this work. Fabricate particleboard substrate at dry locations and veneer core substrate at wet locations.

2.3.5.1 Counter Top With Sink

a. Provide countertops with sinks that include cutouts to template as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for stainless steel installation. Seal seam between sink and counter top must be sealed with silicone sealant. Install sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

b. Provide solid polymer sinks that are a manufacturer's standard, pre-molded product specifically designed for attachment to solid polymer countertops.2.3.5.2 Vanity Tops With Bowls

a. Provide solid polymer bowls as manufacturer's standard, pre-molded product specifically designed for attachment to solid polymer counter tops. Bowl must be undermounted.

2.3.6 Solid Polymer Vanity Bowls

Provide solid polymer vanity bowls that are a standard product of the solid polymer manufacturer, designed specifically to be installed in solid polymer vanity tops. Provide bowls of the same polymer composition as the adjoining counter top. Provide a bowl design that supports a seam adhesive undermount installation method. The bowl and countertop shall align
for a flush mount with inconspicuous seams. Provide bowl dimension as indicated on the drawings. Solid polymer bowls must be solid white in color.

2.3.7 Shower Wall Panel System

Provide shower wall enclosures in a system of solid polymer components to include: panels corner trim, shower shelf panel edge trim. Provide dimensions of all components as indicated on the drawings. Panels must be formed from manufacturer's standard 1/4 inch thick sheet product. Provide full width and height panels with seams occurring only at the inside corners of the enclosure. Shower shelves must be of a configuration, shape, and location as standard with the manufacturer's system.

2.3.7.1 Solid Surface Shower Base

Solid surface material; shower pans to be custom fabricated from 100% acrylic slabs of Solid Surface material or a polyester/acrylic blend. Pan must be mitered at a sloped angle towards the drain. Solid surface polymer materials must be composed of fully densified aluminum trihydrate mineral fillers, homogeneously blended in an engineered, UV stabilized acrylic modified polyester resin. Shower pan size must be coordinated with the drawings. Shower floor must have integrally molded support bracing on the bottom, positive sloped non-slip textured interior floor, and an integral perimeter flange. Flange at back of pan must be able to recieve an oblique scupper style drain assembly. Solid surface products shower receptors must incorporate integral threshold and curb.

2.3.7.2 Shower Base Characteristics

Tensile Strength: 6,000 psi, when tested in accordance with ASTM D638
Flexural strength: 8,300 psi, when tested in accordance with ASTM D790
Modulus of Elasticity: 1.2 x 10 psi per ASTM D790
High Temperature Resistance: No Effect, when tested in accordance with ANSI/NEMA LD 3
Stain Resistance: Passes, when tested in accordance with ANSI Z124
Flame Spread: Class A, when tested in accordance with ASTM E84

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Do not install items that show visual evidence of biological growth. Install all components and fabricated units plumb, level, and rigid. Make field joints between solid polymer components using solid polymer manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Install all solid polymer sinks and bowls using a color-matched seam adhesive. Install all plumbing connections to sinks and lavatories in accordance with Section 22 00 00

PLUMBING, GENERAL PURPOSE.

3.1.2 Silicone Sealant

Use a clear, silicone sealant or caulk to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead must be smooth and uniform in appearance and use the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Install continuous bead that runs 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

Clean all components after installation and cover to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will provide a repair/replace cost estimate to the General Contractor who must approve estimate before repairs are made. Submit a minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Provide maintenance video if available. Submit maintenance kit for matte finishes.

-- End of Section --

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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.

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 D5359	(2015) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation

Recycled Content for Insulation Materials; S

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials; S

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 Acoustical BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings and a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84.

2.1.1 Thermal Resistance Value (R-VALUE)

The R-Value is 3.16 per inch.

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 ACCESSORIES

2.2.1 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 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.

Place insulation in permanent contact with the six surfaces that enclose each cavity, and provide a thickness and width corresponding to the cavity depth and shape. Specified insulation R-values are minimums. Provide greater thicknesses and R-values to fully fill cavities without

compression.

3.1.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.1.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs and any obstructions. Provide continuity and integrity of insulation at corners, and floor. Avoid creating thermal bridges.

3.1.1.3 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between studs and other framing.

3.1.1.4 Sizing of Blankets

Provide only full width blankets when insulating between studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

-- End of Section --

SECTION 07 60 00

FLASHING AND SHEET METAL
05/17, 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.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 621	(2014) High-Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates
AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A480/A480M	(2020a) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B370	(2022) Standard Specification for Copper Sheet and Strip for Building Construction

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

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

1.2 GENERAL REQUIREMENTS

Finished sheet metal assemblies must form a weathertight enclosure without waves, warps, buckles, fastening stresses or distortion, while allowing for expansion and contraction without damage to the system. The sheet metal installer is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal modifications required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous, uninterrupted roofing operations.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Exposed Sheet Metal Coverings

Drip Edges

Recycled Content; S

SD-04 Samples

Finish Samples

SD-08 Manufacturer's Instructions

Quality Control Plan

SD-10 Operation and Maintenance Data

Cleaning and Maintenance

1.4 MISCELLANEOUS REQUIREMENTS

1.4.1 Product Data

Indicate thicknesses, dimensions, fastenings, anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

1.4.2 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.

1.4.3 Operation and Maintenance Data

Submit detailed instructions for quality control during installation,

cleaning and maintenance, for each type of assembly indicated.

1.5 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until installation.

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

Do not use lead-coated metal or galvanized steel. Provide materials, thicknesses, and configurations in accordance with SMACNA 1793 for each material. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items must be copper, and that contact between dissimilar metals must be avoided.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide miscellaneous flashing and sheet metal using the same materials as the items to which they are applied or compatible Table 1 materials. Fabricate required items to the gage, thickness, and of material options shown in Table I at the end of this section.

2.2.1 Exposed Sheet Metal Items

Must be of the same material to which it attaches. Consider the following as exposed sheet metal: flashings and related accessories.

2.2.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces.

2.3 APPROVED MISCELLANEOUS METALS

2.3.1 Solder

Provide in accordance with ASTM B32, 95-5 tin-antimony.

2.3.2 Fasteners

Use stainless steel fasteners to fasten. Confirm compatibility of fasteners and items to be fastened to avoid galvanic corrosion due to dissimilar materials.

Finish exposed rivets and fasteners to match substrate colors

encountered.

2.3.3 Copper, Sheet and Strip

Provide in accordance with ASTM B370, cold-rolled temper, H 00 (standard).

2.3.4 Lead Sheet

Provide in a minimum weight of 4 pounds per square foot.

2.3.5 Steel Sheet, Zinc-Coated (Galvanized)

Provide in accordance with ASTM A653/A653M. Prefinished steel sheet coil is 0.024 inch, 24 gauge conforming to ASTM A653/A653M, Class G90 and AAMA 621.

2.3.5.1 Organic Coating

Furnish prefinished steel with an organic coating treatment conforming to AAMA 2605 to obtain a 70% PVDF coating.

2.3.6 Stainless Steel

Provide in accordance with ASTM A480/A480M, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.3.7 Aluminum Alloy Sheet and Plate

Provide in accordance with ASTM B209 form alloy, and temper appropriate for use. Provide material not less than 0.040-in in thickness.

Furnish aluminum with an organic coating treatment conforming to AAMA 2605 to obtain a 70% PVDF coating.

2.3.7.1 Alclad

When fabricated of aluminum, fabricate the following items with Alclad 3003, Alclad 3004, or Alclad 3005, clad on one side unless otherwise indicated.

a. Gravel stops and fascia

b. Flashing

2.3.8 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

ASTM B221.

2.3.9 Finishes

Color is to match the sheet metal on the adjoining building for additions. Field applications of color coatings are prohibited and will be rejected.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles required to accommodate terminations, edges and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.2 Cleats

Provide cleats for sheet metal 18 inches and over in width. Cleats are continuous. Unless otherwise specified, provide cleats of 2 inches wide and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Pre-tin cleats for soldered seams.

3.1.3 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inches or less in thickness.

3.1.4 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.4.1 Flat-lock Seams

Finish not less than 3/4 inch wide.

3.1.4.2 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inches.

3.1.4.3 Loose-Lock Expansion Seams

Not less than 3 inches wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.4.4 Standing Seams

Not less than one inch high, double locked without solder.

3.1.4.5 Flat Seams

Make seams in the direction of the flow.

3.1.5 Soldering

Where soldering is specified, apply to copper and stainless steel items. Pre-tin edges of sheet metal before soldering is begun. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.5.1 Edges

Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pre-tinned. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.6 Mechanical Fastening

Aluminum 0.040 inch or less in thickness must be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.

3.1.6.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to AWS D1.2/D1.2M.

3.1.6.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inches maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inches from the end of the overlapping sheet.

3.1.7 Protection from Contact with Dissimilar Materials

3.1.7.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.7.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.7.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry

materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.8 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascia by expansion and contraction joints spaced not more than 12 feet apart.

3.1.9 Counterflashing

Except where indicated or specified otherwise, insert counterflashing above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inches. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths a minimum of 8 inches by 8 inches or may be of the preformed single piece type. Provide end laps in counterflashings not less than 3 inches and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form flashings to the required shapes before installation. Factory form corners not less than 12 inches from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inches apart; on short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound. Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inches into the walls. Install counterflashing to provide a spring action against base flashing.

3.1.10 Gravel Stops and fascia

Prefabricate in the shapes and sizes indicated and in lengths not less than 8 feet. Extend flange at least 4 inches onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascia after all plies of the roofing membrane have been applied, but before the flood coat of bitumen is applied. Prime roof flange of gravel stops and fascia on both sides with an asphalt primer. After primer has dried, set flange on roofing membrane and strip-in. Nail flange securely to wood nailer with large-head, barbed-shank roofing nails 1.5 inch long spaced not more than 3 inches on center, in two staggered rows.

3.1.10.1 Edge Strip

Hook the lower edge of fascia at least 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 6 inches maximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inches on center driven in expansion shields set in the concrete or masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 1/16 inch thick compatible spacer or washers.

3.1.10.2 Joints

Leave open the section ends of gravel stops and fascia 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inches set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascia in accordance with the manufacturer's printed instructions and details.

3.1.11 Metal Drip Edges

Provide a metal drip edge, designed to allow water run-off to drip free of underlying construction, at eaves and rakes prior to the application of roofing.

3.1.12 Sheet Metal Covering on Flat, Sloped, or Curved Surfaces

Except as specified or indicated otherwise, cover and flash all minor flat, sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, 16 by 18 inches. Fasten sheets to sheathing with metal cleats. Lock seams and solder. Lock aluminum seams as recommended by aluminum manufacturer. Provide an underlayment of roofing felt for all sheet metal covering.

3.2 PAINTING

Touch ups in the field may be applied only after metal substrates have been cleaned and pretreated in accordance with manufacturer's written instructions and products.

Field-paint sheet metal for separation of dissimilar materials.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification that specified material is provided and installed.

c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch		
Downspouts and leaders	16	.032	.015		
Downspout clips and anchors	-	.040 clip .125 anchor	-		
Downspout straps, 2-inch	48 (a)	.060	.050		
Conductor heads	16	.032	.015		
Scupper lining	20	.032	.015		
Strainers, wire diameter or gage	No. 9 gage	.144 diameter	.109 diameter		
Flashings:					
Base	20	.040	.018		

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch		
Counter-flashing	16	.032	.015		
Eave	16	-	.015		
		-			
		-			
Stepped	16	.032	.015		
Pipe vent sleave					
Coping	16	.040			
Extrusions	-	.075	-		
Sheets, smooth	20	.050	.018		
Edge strip	24	.050	.025		
Gutters:					
Gutter section	16	.032	.015		
Continuous cleat	16	.032	.015		
Hangers, dimensions	1 inch by 1/8 inch (a)	1 inch by .(inch	1 inch by .0 inch		
Joint Cover plates (See Table II)	16	.032	.015		
		-			
(a) Brass.					

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch		

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copperl and Stainless Steel	Aluminum	Remarks
Flashings			
Base	One inch 3 inch lap for expansion joint	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum manufacturer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound.

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copperl and Stainless Steel	Aluminum	Remarks
		--	
Eave	One inch flat locked, cleated. One inch loose locked, sealed expansion joint, cleated.	One inch flat locked, locked, cleated one inch loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Edge strip	Butt	Butt	--
Gravel stops:			
Extrusions	--	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate
Sheet, smooth	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing backup plate.
Gutters	1.5 inch lap, riveted and soldered	One inch flat locked riveted and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copperl and Stainless Steel	Aluminum	Remarks

-- End of Section --

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SECTION 07 84 00.00 22

FIRESTOPPING
09/23

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; firestopping material must not 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.

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2023) 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 E1966	(2015; R 2019) Standard Test Method for Fire-Resistive Joint Systems

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

UNDERWRITERS LABORATORIES (UL)

UL 723	(2020) 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. Cast-in-place firestop devices must be located and installed in place before concrete placement. Pipe, conduit, or cable bundles must be installed 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 all submittals. Shop drawings (SD-02), product data (SD-03), and Certificates (SD-07) must be prepared by the designer and combined and submitted as one complete package. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System

SD-03 Product Data

Firestopping Materials

SD-06 Test Reports

Inspection Forms
Inspection Report

SD-07 Certificates

Firestopping Inspector Qualifications
Firestopping Materials
Firestopping Installer Qualifications

1.5 QUALITY ASSURANCE

1.5.1 Firestopping 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. When approved by the Authority Having Jurisdiction (AHJ), certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary training, and a minimum of 3 years' experience in the installation of the 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 Firestopping Installer Qualifications on the buyer. The Firestopping Installer must have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures of the manufacturer's products. The Firestopping Installer must obtain from the manufacturer and submit written certification of training, and retain proof of certification for duration of firestop installation. AHJ approval criteria for option (b) is generally limited to small jobs consisting of one trade with few penetration or joint systems.

There must be a single qualified Installer for the entire project. Multiple qualified Installers employed by the same organization will also be permitted. Each Installer's qualifications must be approved by the Government.

1.5.2 Firestopping Inspector Qualifications

The Firestopping Inspector must meet all of the following:

a. Be completely independent of, and divested from, the Firestopping Installer, the manufacturer, and the supplier of any material or item being inspected, and

b. Not be a competitor of the Firestopping Installer, the contractor, the manufacturer, or supplier of any material or item being inspected, and

c. Have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies.

In addition, the Firestopping Inspector must meet one of the following::

a. Passed the UL Firestop exam within the last three years, or

b. Passed the FM Firestop exam within the last three years, or

c. Passed the International Firestop Council (IFC) exam within the last three years, or

d. Completed the International Code Council (ICC) Firestopping Credential of Learning Achievement within the last three years, or

e. Be a registered Professional Engineer who has passed the National Council of Examiners for Engineering and Surveying (NCEES) Fire Protection Engineer exam. Submit documentation demonstrating experience in construction field inspections of firestopping systems, products, and assemblies for a minimum of 3 relevant projects. Include a description of the project and date of construction completion.

Include in the qualifications submittal a signed statement asserting compliance with the requirements stated in this paragraph.

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.

Submit a written report with floor plans indicating locations 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. Material must be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.2.2 Toxicity

Materials must have a Health Rating of 0 or 1, as indicated in the product Safety Data Sheet. Products must 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 = Rating of wall or partition being penetrated.

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. Construction joints and gaps must be provided 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. Curtain wall joints must be provided 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. 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 must provide a minimum class II movement capability.

2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer must provide certification of compliance with UL 1479.

All materials must bear a Listing Label. Manufacturer's container labels must include the manufacturer's name, product name, and product description. Other components of the firestop must also be identifiable by labeling or other method by the NAVFAC Designated Fire Protection Engineer (DFPE).

PART 3 EXECUTION

3.1 PREPARATION

The installer must notify the inspector of the arrival of the materials. Prior to installation, the Inspector must verify that all materials received for the installation meet the requirements of the approved Firestopping Materials.

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 4 inches 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 the bottom of walls and floor slabs and 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

Thermal insulation must be cut and removed 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.

3.2.3 Data and Communication Cabling

Cabling for data and communication applications must be sealed with re-enterable firestopping products.

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 400 degrees F 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. Firestopping products must allow for cable moves, additions, or changes. Devices must be 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 Navy projects, install one of each type of penetration and have it inspected and accepted prior to the installation of the remainder of the penetrations by one of the following:

a. The Mid-Atlantic Division, Naval Facilities Engineering Systems Command, Fire Protection Engineer (DFPE).

b. The project Fire Protection QC Specialist (FPQC).

c. The Firestopping Inspector, witnessed by a designated Government representative.

d. The Firestopping Inspector, with a detailed Inspection Form submitted to the Mid-Atlantic Division, Naval Facilities Engineering Systems Command, Fire Protection Engineer (DFPE) for review and approval within two days of the inspection. The Inspection Form must include:

1) General project identification information

2) Name of Firestopping Inspector

3) Location of system with a partial floor plan to highlight location

4) UL system or Engineering Judgement and rating

5) Description of rated assembly being penetrated and type of penetrant

6) Photographs of destructive samples taken or photographs of steps taken during the installation

7) Measurement of cut samples must be shown in photographs with a ruler. Provide photographs of the joint or penetration prior to firestopping; after firestopping; and intermediate steps. Photographs may be provided in electronic (.jpeg or .pdf) format. Photographs must provide sufficient angles and detail to show conformance with requirements of the system.

8) General observations

9) Statement of compliance or non-compliance

The means of inspection must be coordinated with the DFPE prior to the inspection. At this inspection, the manufacturer's technical representative of the firestopping material must be present. The manufacturer's technical representative may be the Firestopping Installer.

For all projects, do not cover or enclose the firestopped areas until inspection is complete and approved by the Contracting Officer. The Firestopping 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

3.3.1.2 The Firestopping Inspector must verify that the materials and systems used for firestopping and fire resistive joint systems are listed and labeled for the use intended.

3.3.1.3 The Firestopping Inspector must verify that the required firestop systems and fire resistive joint systems have been installed.

3.3.1.4 The Firestopping Inspector must verify compliance of the firestop systems and fire resistive joint systems by observing the installation process and by taking and recording measurements of the substrates and materials being installed or by destructive examination of completed installations.

3.3.1.5 Inspection frequency of firestop systems and fire resistive joint systems will depend on the method of inspection and the scope of the project.

3.3.1.5.1 The method of inspection for firestop systems must be one of the following:

a. The Firestopping Inspector must be on site during installation and randomly witness a minimum of 10% of each type of firestop system being installed, or

b. The Firestopping Inspector must conduct a post installation inspection, which requires destructive type verification of the firestop system and repair of the firestop system. A minimum of 2%, but not less than one, of each type of firestop system must be inspected per floor or for each area of a floor when a floor is larger than 10,000 SF. An area consists of 10,000 SF or less.

3.3.1.5.2 The method of inspection for fire resistive joint systems must be one of the following:

a. The Firestopping Inspector must be on site during installation and randomly witness a minimum of 5% of total lineal feet of each type of fire resistive joint system being installed, or

b. The Firestopping Inspector must conduct a post installation inspection in accordance with one of the following:

1) Destructive type verification of the fire resistive joint system and repair of the joint system, or

2) Disassembly and verification of the components and re-installation of the joint system, or

3) Visual inspection and verification of the component or entire joint system, where a visual inspection establishes conformance; or

4) Other appropriate methods showing compliance with the approval process or the manufacturers' instructions.

Inspection must consist of a minimum of one sampling per type of joint system per 500 lineal feet.

3.3.1.6 Prior to construction, the Firestopping Inspector must coordinate with the NAVFAC DFPE to determine the types of firestop systems and subsequently the number of each type that is to be inspected. The determination of a "type" will typically be a function of a unique combination of parameters, including penetrant type (for example, metal pipe, plastic pipe, cabling), firestop material or device (for example, intumescent caulk, collar, sealant), penetrated substrate (for example, gypsum wall, concrete floor, composite floor deck), and rating of penetrated item.

3.3.1.7 Any type of firestop system that does not comply with this specification will require repair or replacement and re-inspection of that firestop system plus one full additional inspection, of the number specified herein, of that type firestop system. If non-compliance occurs on 10% or more of the quantity of firestop products or firestop systems, then inspection of those particular type firestop systems must cease. The Firestopping Installer must inspect their own work, and repair or replace those like firestops within the area prior to re-commencement of inspections by the Firestopping Inspector.

3.3.1.8 The Firestopping Inspector must maintain inspection forms. All observed deficiencies must be documented and marked on the inspection forms. In addition, the Firestopping Inspector must physically identify the location where a required firestop system has been omitted or where the inspection results indicate that the installed firestop system does not comply with the inspection documents. The Inspection Forms must include the following:

a. General project identification information

b. Name of Firestopping Inspector

c. Location of system with a partial floor plan to highlight location

d. UL system or Engineering Judgement and rating

e. Description of rated assembly being penetrated and type of penetrant

f. Photographs of destructive samples taken or photographs of steps taken during the installation

g. Measurement of cut samples must be shown in photographs with a ruler. Provide photographs of the joint or penetration prior firestopping; after firestopping; and intermediate steps. Photographs may be provided in electronic (.jpeg or .pdf) format. Photographs must provide sufficient angles and detail to show conformance with requirements of the system.

h. General observations

i. Statement of compliance or non-compliance

Submit the inspection forms to the DFPE for surveillance within two days of the inspection.

3.3.2 Inspection Report

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.

3.3.2.1 The report must contain a cover page with the following:

a. The project name, location, and contract number;

b. The name and address of the Firestopping Inspector;

c. The name and address of the Firestopping Installer (s), as well as the prime contractor, if different; and

d. Report date.

3.3.2.2 The report must include drawings indicating locations and types of all penetrations and fire resistive joint systems and types of firestopping used at each location; type must be identified by UL listed printed numbers. Annotated inspected systems with a unique designator that correlates with the Inspection Forms. The drawings must include smoke barriers and partitions and indicate the methods and materials used to protect penetrations.

3.3.2.3 Include UL system details or Engineering Judgements, annotated to identify specific ratings and assembly components.

3.3.2.4 The report must contain a summary page with the following:

a. Types and quantity of each firestop system and fire resistive joint system on the project.

b. The verification method used to ascertain compliance.

c. The quantity of each firestop system and fire resistive joint system inspected on the project and a written statement by the Firestopping Inspector that the number of firestop systems and fire resistive joint systems inspected comply with this specification.

d. Percentages of deficiencies for each type of firestop system and fire resistive joint system referenced.

e. A total number of deficiencies, expressed as a percentage of the total number of firestop systems and fire resistive joint systems inspected.

f. Narrative of inspection observations and description of means and methods used to correct deficiencies. Include a description of deviations from the design documents.

g. Additional information, as determined by the Firestopping Inspector, required to adequately convey compliance.

3.3.2.5 The report must contain copies of all Inspection Forms generated during the inspection process, arranged chronologically.

3.3.2.6 Submit a Final Inspection Report at least 14 days prior to Government acceptance testing for review and approval.

3.3.3 Acceptance

The Government may require additional destructive testing at the time of Government acceptance testing. Systems that are subject to destructive testing must be replaced, at no cost to the Government, by the project's qualified Firestopping Installer. Confirmation that the system replaced complies must be provided by the Firestopping Inspector.

-- End of Section --

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SECTION 07 92 00

JOINT SEALANTS
08/16, CHG 3: 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.

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specifiaction for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C734	(2015; R 2019) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C919	(2022) Standard Practice for Use of Sealants in Acoustical Applications
ASTM C920	(2018; R 2024) Standard Specification for Elastomeric Joint Sealants
ASTM C1193	(2013) Standard Guide for Use of Joint Sealants
ASTM C1311	(2014) Standard Specification for Solvent Release Agents
ASTM C1521	(2013) Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
ASTM D217	(2019b) Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants

Primers

Bond Breakers

Backstops

SD-06 Test Reports

Field Adhesion

SD-07 Certificates

Indoor Air Quality For Interior Sealants; S

Indoor Air Quality For Interior Floor Joint Sealants; S

Indoor Air Quality For Interior Acoustical Sealants; S

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 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.4.1.1 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 program 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.

1.5 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.6 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 90 degrees F or lower than 0 degrees F. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

1.7 QUALITY ASSURANCE

1.7.1 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.

1.7.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.7.3 Adhesion

Provide in accordance with ASTM C1193 or ASTM C1521.

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.

2.1.1 Interior Sealants

Provide ASTM C920, Type S or M, Grade NS, Class 12.5, Use NT. Provide sealant 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 for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. 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.	AAs selected
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected
f. 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, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. 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
b. Joints between new and existing exterior masonry walls.	As selected

LOCATION	COLOR
c. Expansion and control joints.	As selected
d. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	As selected
e. Voids where items pass through exterior walls.	As selected
f. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	As selected
g. Metal-to-metal joints where sealant is indicated or specified.	As selected
h. Joints between ends of fascia, flashings, and adjacent walls.	As selected

2.1.3 Floor Joint Sealants

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide sealant 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 for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior floor joint sealants. 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 with 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 when tested in accordance with ASTM D217. Acoustical sealant must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734. Provide sealant 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 for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior acoustical sealants.

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 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 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 with ASTM D1056, Type 2, closed cell, Class A, round cross section for cellular rubber sponge backing.

2.4.2 Synthetic Rubber

Provide in accordance with ASTM C509, Option I, Type I preformed rods or tubes for synthetic rubber backing.

2.4.3 Neoprene

Provide in accordance with ASTM D1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2 neoprene backing.

2.4.4 Butyl Rubber Based

Provide in accordance with ASTM C1311, from a single component, with solvent release. color as selected from manufacturer's full range of color choices.

2.4.5 Silicone Rubber Base

Provide in accordance with ASTM C920, from a single component, with solvent release, Non-sag, Type S, Grade NS, Class 25. Color as selected

from manufacturer's full range of color choices.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent aluminum 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 and ASTM C1193, Method A or ASTM C1521, Method A, Tail Procedure. 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 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 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.

3.3 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:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 1 inch	1/2 inch	5/8 inch
Over 1 inch	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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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 WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879/A879M	(2012; R 2017) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2021) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM D2863	(2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2016) Hardware Preparation in Steel Doors and Steel Frames

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

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 113	(2013; R2018) Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.6	(2015) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2023) Specifications for Standard Steel Doors and Frames
SDI/DOOR A250.11	(2012) Recommended Erection Instructions for Steel Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2016; Reprint May 2021) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

Government approval is required for all submittals.. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors

Frames

Accessories

Schedule of Doors

Schedule of Frames

SD-03 Product Data

Doors

Recycled Content for Steel Door Product; S

Frames

Recycled Content for Steel Frame Product; S

Accessories

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 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STEEL DOORS

SDI/DOOR A250.8. 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 1-3/4 inch thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel door product.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Heavy Duty Doors

SDI/DOOR A250.8, Level 2, physical performance Level B, Model 2, with core construction as required by the manufacturer, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation.

2.1.1.2 Maximum Duty Doors

SDI/DOOR A250.8, Level 4, physical performance Level A, Model 2 with core construction as required by the manufacturer 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 board insulation.

2.2 ACCESSORIES

2.2.1 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.

2.3 INSULATION CORES

Provide insulating cores at all exterior doors, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and conforming to one of the following:

a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or

b. Rigid Polystyrene Foam Board: ASTM C578, Type I or II; or

c. Mineral board: ASTM C612, Type I.

2.4 STEEL FRAMES

SDI/DOOR A250.8, Level 4 for exterior doors and Level 2 for interior doors . Form frames to sizes and shapes indicated, with welded corners. . Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame product.

2.4.1 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 the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.4.2 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.

2.4.3 Stops and Beads

Provide formed and loose stops and beads from 20 gage 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 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.4.4 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated not lighter than 18 gage.

2.4.4.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch 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;

2.4.4.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each

jamb member.

2.5 FIRE AND SMOKE DOORS AND FRAMES

Provide fire doors and frames in accordance with NFPA 80 and this specification. Include insulated core materials in fire doors where required.

2.5.1 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.

2.5.2 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

2.6 EXTERIOR FRAMES

Provide thermal insulation in all exterior frames. Provide frames of a minimum Level 4, with frames of a minimum thickness of 0.067 inch, 14 gage.

2.7 HARDWARE PREPARATION

Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Punch door frames, with the exception of frames that will have weatherstripping, to receive a minimum of two rubber 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.

2.8 FINISHES

2.8.1 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A924/A924M and ASTM A653/A653M. The coating weight must meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. 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 SDI/DOOR A250.8.

2.8.2 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A879/A879M, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.9 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. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

2.10 PROVISIONS FOR GLAZING

Scheduled interior doors receive 0.25 inch glass and scheduled exterior doors receive 1 inch insulated glass composites. Glass is specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. 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.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. .

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.

-- End of Section --

SECTION 08 11 16

ALUMINUM DOORS AND FRAMES
05/17, 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.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

1.2 PERFORMANCE REQUIREMENTS

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

For Each Type of Door and Frame Assembly

SD-03 Product Data

For Each Type of Door and Frame Assembly

Recycled Content of Aluminum Material; S

SD-04 Samples

Finish Samples

SD-08 Manufacturer's Instructions

Installation of Each Type of Door and Frame Assembly

SD-10 Operation and Maintenance Data

Adjustments, Cleaning, and Maintenance

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, 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.

1.5.2 Finish Samples

Submit two color charts and two finish sample chips 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 SYSTEM DESCRIPTION

Provide aluminum entrances, with glass and glazing, door hardware, and components.

Aluminum entrances include 6 inch vertical face dimension, 1 3/4 inch depth, for interior structural silicone glaze, for high-traffic/impact-resistant applications.

Provide door stile and rail face dimensions of the entrance doors as follows:

Vertical Stile	Top Rail	Bottom Rail
6 inches	8 inches	10 inches

Provide major portions of the door members at 0.125 inches nominal in thickness and glazing molding at 0.050 inches thick.

2.2 DOORS AND FRAMES

Provide swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members , trim, and accessories. Coordinate side lites, window walls, adjacent curtainwall with Section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.

2.3 MATERIALS

2.3.1 Anchors

Stainless steel or steel with hot-dipped galvanized finish.

2.3.2 Aluminum Alloy for Doors and Frames

ASTM B221M, ASTM B221, Alloy 6063-T5 for extrusions. ASTM B209M, ASTM B209, alloy and temper best suited for aluminum sheets and strips. Provide aluminum materials that include a minimum of 30 percent recycled content. Provide data indicating percentage of recycled content of aluminum material.

2.3.3 Fasteners

Hard aluminum or stainless steel.

2.3.4 Structural Steel

ASTM A36/A36M.

2.3.5 Finish

Give aluminum extrusions for heavy commercial applications a pretreatment to enhance adhesion followed by a caustic etch or alkaline wash for cleaning and degreasing. Apply a phosphate spray or chromate conversion treatment to protect against humidity and corrosive chemicals. Furnish an organic coating treatment conforming to AAMA 2605 to obtain a 70% PVDF coating. Provide a two coat application consisting of 0.2 mils of primer with a 1.0 mil topcoat that achieves a 1.2 mil thickness.

Aluminum doors and frames are Black.

2.4 FABRICATION

2.4.1 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 12 inches on center. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

2.4.2 Aluminum Doors

Of type, size, and design indicated and minimum 1-3/4 inch thick. minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal; include standard clearances as follows: 0.093 inch at hinge and lock stiles, 0.125 inch between meeting stiles, 0.125 inch at top rails, 0.187 inch between bottom and threshold, and 0.687 inch between bottom and floor. Provide bevel single-acting doors 0.063 or 0.125 inch at lock, hinge, and meeting stile edges.

2.4.2.1 Full Glazed Stile and Rail Doors

Provide doors with 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 3/8 or 1/2 inch 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.

2.4.3 Welding and Fastening

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1 1/8 inch long fillet welds inside and outside all four corners. Provide a hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord. Provide an interior glazing stop that is mechanically fastened to the door member and that incorporates a silicone-compatible spacer used with silicone sealant.

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.

2.4.4 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 and wall constructions. Place anchors near top and bottom of each jamb and at intermediate points not more than 25 inch apart.

2.4.5 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.

2.4.5.1 Retail Deadlocks

Concealed retail deadlocks have aluminum faceplates and eight ply, laminated stainless steel bolts with 1.375 inch throw. Locks accept standard 1.1563 inch mortise cylinders for keyed exterior access and thumbturn or mortise cylinder on interiors.

2.4.5.2 Two Point Flushbolts

Auto release, two point flushbolt secures inactive door tops and bottoms followed by normal engagement of retail deadlocks through the lock strike cutout. Retract the deadlock by turn of key and the mechanism releases allowing both door leaves to swing freely.

2.4.6 Provisions for Glazing

Design glazing beads to receive thickness indicated for each glazed assembly. Glass for interior locations has a 0.25 inch thickness. Coordinate requirements with Section 08 81 00 GLAZING.

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. 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 3/32 inch 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.

3.3 SEALING AROUND ASSEMBLIES

Seal all penetrations of the air barrier by sealing around door openings as necessary to achieve compliance with air leakage requirements indicated in the air barrier sections of the specifications. 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.

3.6 HARDWARE SCHEDULE

FMC = Full Metal Cover; LHR = Left Hand Reverse; RHR = Right Hand Reverse; SFIC = Small Format Interchangeable Core

3.6.1 ALUMINUM DOOR HARDWARE SCHEDULE

Heavy Duty Interior Openings

Door No. 204A
HWS-1 Retail Entrance Pair

	6	each Offset Pivot Hinge	White
Section 08 71 00	2	each FMC Closer, C02231 with spring stop, stop mounted slide track arm push side mount	630
Active Leaf RHR			
Adams Rite	1	each Concealed Retail Deadlock back to back cylinders, entry by keyed trim, public use while retracted	628
Section 08 71 00	2	each Mortise Cylinder Housing, F25, E09251	630
Section 08 71 00	2	each 7 Pin SFIC, F24, E09241	630
Inactive Leaf LHR			
	1	each Auto Release, Two Point Flush Bolt	626
Section 08 71 00	1	each Dust Proof Strike, L04021	626
	2	each Bent Bar Push	White
	2	each Bent Bar Pull	White
Section 08 71 00	2	each Wall Stop, L02251 or Floor Stop, L02161	626

Door No. 204B
HWS-2 Exterior Retail Entrance

	3	each Offset Pivot Hinge	White
Section 08 71 00	1	each FMC Closer, C02231 with spring stop, stop mounted slide track arm push side mount	630
	1	each Concealed Retail Deadlock back to back cylinders, entry by keyed trim, public use while retracted	628
Section 08 71 00	2	each Mortise Cylinder Housing, F25, E09251	630
Section 08 71 00	2	each 7 Pin SFIC, F24, E09241	630
	1	each Bent Bar Push	White
	1	each Bent Bar Pull	White
Section 08 71 00	1	each Wall Stop, L02251 or Floor Stop, L02161	626

-- End of Section --

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SECTION 08 14 00

WOOD DOORS
08/16, 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 in the text by the basic designation only.

AMERICAN FOREST FOUNDATION (AFF)

ATFS STANDARDS	(2015) American Tree Farm System Standards of Sustainability 2015-2020

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120	(2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products

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

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013	(2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements

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

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1	(2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors

Submit drawings or catalog data showing each type of door unit . Indicate within drawings and data the door types and construction, sizes, thickness, and glazing.

SD-03 Product Data

Doors

Recycled Content for Door Cores; S

Accessories

Water-resistant Sealer

Sample Warranty

SD-04 Samples

Door Finish Color

Submit a minimum of three color selection samples , minimum 3 by 5 inches in size representing wood stain.

SD-07 Certificates

Certified Sustainably Harvested Flush Wood Doors; S

Indoor Air Quality for Particleboard and Agrifiber Door Cores: S

SD-11 Closeout Submittals

Warranty

1.3 CERTIFICATIONS

1.3.1 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.

1.3.2 Indoor Air Quality Certification

1.3.2.1 Composite Wood, Wood Structural Panel and Agrifiber Products

For purposes of this specification, composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, and door cores. Provide products certified to meet requirements of both 40 CFR 770 and CARB 93120. Provide current product certification documentation from certification body.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.5 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated free of urea-formaldehyde resins.

2.1.1 Flush Doors

Conform to ANSI/WDMA I.S.1A for flush doors. Hardwood stile edge bands of doors receives a natural finish, compatible with face veneer. Provide mill option for stile edge of doors scheduled to be painted. No visible finger joints will be accepted in stile edge bands. Provide certified sustainably harvested flush wood doors.

2.1.1.1 Interior Flush Doors

Provide particleboard or agrifiber core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of good grade white oak. Hardwood veneers must be quarter sliced. Door cores must have a minimum recycled content of 45 percent. Provide data identifying percentage of recycled content for door cores. Products must contain no added urea-formaldehyde resins. Provide certification of indoor air quality for particleboard and agrifiber door cores.

2.2 ACCESSORIES

2.2.1 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers. Use lip type moldings for flush doors.

2.2.2 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. The measurement of top, bottom, and intermediate rail blocks are a minimum 125 mm 5 inch by full core width. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Quality and Construction

Identify the standard on which the construction of the door was based .

2.3.2 Adhesives and Bonds

ANSI/WDMA I.S.1A. Use Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.3 Prefitting

Provide factory prefitted doors for the specified hardware, door frame and door-swing indicated. Machine and size doors at the factory by the door manufacturer in accordance with the standards under which the doors are produced and manufactured. The work includes sizing, beveling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules to coordinate the work.

2.3.4 Finishes

2.3.4.1 Field Painting

Factory seal doors. Door finish color is WD-1.

2.3.4.2 Factory Finish

At the contractor's option, provide doors finished at the factory by the door manufacturer as follows: WDMA System TR-8 (UV cured acrylated polyester/urethane) or TR-2 (catalyzed lacquer) or TR-4 (conversion varnish) factory finish systems that utilize water-based stains and finishes with ultraviolet UV protection. The coating is NAAWS 3.1 premium, medium rubbed sheen, closed grain effect.

Otherwise, field finish doors. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.5 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finish.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp must not exceed 1/4 inch when measured in accordance with ANSI/WDMA I.S.1A.

-- End of Section --

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SECTION 08 33 13

COILING COUNTER DOORS
05/09, CHG 2: 11/12

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.

ASTM INTERNATIONAL (ASTM)

ASTM A240/A240M	(2024b) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Warranty
Rolling Counter Doors
Installation
Cleaning

SD-11 Closeout Submittals

Rolling Counter Door (Non-Rated)

1.3 QUALITY ASSURANCE

Submit Detail Drawings showing elevations of each door type, details of anchorage, details of construction, location and description of hardware, shape and thickness of materials, details of joints and connections, and details of guides and fittings. Include a schedule showing the location of each counter door with the drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver rolling counter doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store rolling counter doors in accordance with the manufacturer's instructions in a dry location that is adequately ventilated and free from dust, water, or other contaminants, and in a manner that permits easy access for inspecting and handling. Handle doors carefully to prevent damage. Replace damaged items that cannot be restored to like-new condition.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Furnish rolling counter doors of the type, size, and design indicated on the drawings. Provide the standard product of a manufacturer regularly engaged in the production of rolling counter doors. Provide each door with a permanent label showing the manufacturer's name and address and the model number of the door. Submit Manufacturer's descriptive data and catalog cuts.

Rolling counter doors are installed in Government Pick Up 211 and Work Room 205.

2.2 BASIC COMPONENTS

2.2.1 Curtain

Fabricate the curtain of 22 gauge stainless steel slats conforming to ASTM A240/A240M, Type 304 or Type 430. Provide thickness of slat material as required by width of opening Use slats approximately 1-1/4 to 1-1/2 inch wide with a depth of crown of 1/2 inch. Fit alternate slats with endlocks to maintain curtain alignment. Provide bottom of curtain with angle or tubular bar reinforcement matching the curtain, and fitted with a resilient bottom seal.

2.2.2 Jamb Guides

Furnish guides of 13 gauge minimum thickness stainless steel conforming to ASTM A240/A240M, Type 304 or Type 430.

2.2.3 Counterbalance Shaft Assembly

Furnish the curtain coiled around a steel tube of sufficient thickness and diameter to prevent deflection exceeding 0.03 inch per foot. Provide a barrel containing oil tempered helical steel torsion springs capable of sufficient torque to counterbalance the weight of the curtain. Calculate the springs to provide a minimum of 7,500 operating cycles (one complete cycle of door operation will begin with the door in the closed position, move to the full open position and return to the closed position).

2.2.4 Brackets

Furnish brackets of a minimum 12 gauge thickness steel if flat plate, or 16 gauge thickness if there are a minimum of 3 returns of 3/4 inch width.

2.2.5 Hood

Provide a hood of 24 gauge stainless steel conforming to ASTM A240/A240M, Type 304 or Type 430.

2.2.6 Locks

Lock the curtain at both sides of bottom bar by a chrome-plated cylinder

lock keyed into the building keying system. Provide keying conforming to Section 08 71 00 DOOR HARDWARE.

2.2.6.1 Two Point Deadlock

Two point deadlock for curtains have a bolt arm with 1.03125 inch throw. Coordinate the bolt, rod, bolt guide and strike to accommodate the overhead door profile. Deadlock is retracted by a 90 degree rotation of the turn on the secure side. The assembly is deadlocked at 360 degree rotation of the turn, preventing operation in either the locked or unlocked position. Standard mortise cylinders on both the secure and unsecure sides control the turn by key.

2.3 ROLLING COUNTER DOOR (NON-RATED)

Construct rolling counter doors, curtains, guides and hood components of stainless steel conforming to the requirements specified herein. Submit complete copies of Data Package 2 for Rolling Counter Doors (Non-Rated) in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Provide a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service.

2.4 FINISH

Exposed parts of the counter door, including the curtain, bottom rail, guides, and hood must be of uniform finish and appearance. Furnish stainless steel with a No. 4 finish. Give all other steel parts a shop coat of primer paint standard with the manufacturer. Provide a factory coated color.

PART 3 EXECUTION

3.1 INSTALLATION

Install doors in accordance with approved detail drawings and manufacturer's instructions. Accurately locate anchors and inserts for guides, brackets, hardware, and other accessories. Upon completion, warped, twisted, or distorted doors are not acceptable. Lubricate, properly adjust, and demonstrate doors to operate freely.

3.2 OPERATION

3.2.1 Manual Operation

Provide curtain operated by means of manual push-up with lift handles or continuous full width lift bar.

3.3 CLEANING

Clean stainless steel doors in accordance with manufacturer's approved instructions. Submit Manufacturer's preprinted installation and cleaning instructions.

3.4 COILING COUNTER DOORS HARDWARE SETS

Sceure Interior Openings

Door No. 205B
HWS-3 Interior Counter Door

	2 each 1875 Two Point Deadlock, E86182	626
	2 each 4060 Turn	626
Section 08 71 00	1 each Power Supply	
	2 each DPDT Balanced Magnetic Switch	MIL
Section 08 71 00	2 each Mortise Cylinder Housing, F25, E09251	630
Section 08 71 00	2 each 7 Pin SFIC, F24, E09241	630
Note:	Furnish electric metallic tubing raceway, cabling, equipment and programming to support connected devices and operate overhead curtain components	

Non Rated Openings

Door No. 211C
HWS-4 Interior Counter Door

	2 each 1875 Two Point Deadlock, E86182	626
	2 each 4060 Turn	626
Section 08 71 00	2 each Mortise Cylinder Housing, F25, E09251	630
Section 08 71 00	2 each 7 Pin SFIC, F24, E09241	630

-- End of Section --

SECTION 08 33 23

STEEL OVERHEAD COILING DOORS
08/20, CHG 1: 02/22

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2603	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures
ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B29.400	(2001; (R 2008) (R 2013) (R 2018)) Combination, "H" Type Mill Chains, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60

	000 PSI Tensile Strength
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM E330/E330M	(2014; R 2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

DOOR AND ACCESS SYSTEM MANUFACTURERS ASSOCIATION (DASMA)

ANSI/DASMA 108	(2017) Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2022) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2020) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA MG 1	(2021) Motors and Generators
NEMA ST 1	(1988; R 1994; R 1997) Specialty Transformers (Except General Purpose Type)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2023; with Change 2, 2024) Structural Engineering

UNDERWRITERS LABORATORIES (UL)

UL 325	(2017; Reprint Feb 2020) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 SUBMITTALS

Government approval is required for all submittal. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overhead Coiling Doors

Counterbalancing Mechanism
Electric Door Operators

Guides

Mounting Brackets

Hood

Installation Drawings

SD-03 Product Data

Overhead Coiling Doors

Hardware

Counterbalancing Mechanism

Electric Door Operators

Recycled content for steel curtain slats; S

SD-05 Design Data

Overhead Coiling Doors

Hardware

Counterbalancing Mechanism

Electric Door Operators

Wind Loading

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals, Data Package 2

SD-11 Closeout Submittals

Warranty

1.3 QUALITY CONTROL

1.3.1 Warranty

Furnish a written guarantee that the helical spring and counterbalance mechanism are free from defects in material and workmanship for not less than 2 years after completion and acceptance of the project.

Warrant that upon notification by the Government, any defects in material, workmanship, and door operation are immediately correct within the same time period covered by the guarantee, at no cost to the Government.

1.3.2 Operation And Maintenance Submittals

Submit 6 copies of the operation and maintenance manuals 30 calendar days prior to testing the Overhead Coiling Door Assemblies. Update and resubmit data for final approval no later than 30 calendar days prior to cContract completion.

Submit Operation and Maintenance Manuals for Overhead Coiling Door Assemblies, including the following items:

Electric Door OperatorsHood

Counterbalancing Mechanism

Painting

Provide operation and maintenance manuals which are consistent with manufacturer's standard brochures, schematics, printed instructions, operating procedures, and safety precautions.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store doors in an adequately ventilated dry location that is free from dirt and dust, water, or other contaminants. Store in a manner that permits easy access for inspection and handling. Handle doors carefully to prevent damage. Remove damaged items that cannot be restored to like-new condition and provide new items.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Exterior overhead coiling doors are insulated and comply with wind loading criteria.

Provide overhead coiling doors with interlocking slats, complete with anchoring and door hardware, guides, hood, and operating mechanisms, and designed for use on openings as indicated. Doors must be spring counterbalanced, rolling type, and designed for use on interior openings, as indicated. Doors must be operated by electric-power with auxiliary hand chain operation. Doors to be surface-mounted type with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position. Mount doors as indicated

2.1.1 Design Requirements

2.1.1.1 Door Detail Shop Drawings

Provide installation drawings for door assemblies which show: elevations of each door type, shape and thickness of materials, finishes, details of joints and connections, details of guides and fittings, rough opening dimensions, location and description of hardware, anchorage locations, and counterbalancing mechanism and door operator details. Include a schedule showing the location of each door with the drawings.

2.1.2 Performance Requirements

2.1.2.1 Wind Loading

Design and fabricate door assembly to withstand the wind loading pressure of at least 50 pounds per square foot in accordace with ANSI/DASMA 108. Provide test data showing compliance with ASTM E330/E330M. Sound engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested. Ensure that the complete assembly meets or exceeds the requirements of ASCE 7-16.

Marine Corps Air Station Cherry Point must resist a 139 mile per hour, ultimate design wind speed, 50 PSF, Risk Category II, Surface Roughness Category C, Exposure Category C lateral load. Comply with UFC 3-301-01 and ASCE 7 as applicable for building system designs and components.

Submit a DELEGATED DESIGN demonstrating compliance

Furnish overhead curtain assemblies that resist lateral loads. Assembly design responsibility is delegated to the Contractor and incorporates specific properties and structural capabilities of selected products and manufacturers.

Supplement delegated design shop drawings with overhead curtain assembly structural computations. Tie general manufacturer data of appurtenant members utilized to project specific conditions. Specify fastening patterns and connections.

2.1.2.2 Operational Cycle Life

Design all portions of the door, hardware and operating mechanism that are subject to movement, wear, or stress fatigue to operate through a minimum number of 10 cycles per day. One complete cycle of door operation is defined as when the door is in the closed position, moves to the fully open position, and returns to the closed position.

2.2 COMPONENTS

2.2.1 Overhead Coiling Doors

2.2.1.1 Curtain Materials and Construction

Provide curtain slats fabricated from Grade A steel sheets conforming to ASTM A653/A653M, with the additional requirement of a minimum yield point of 33,000 psi. Provide 22 gauge sheets, Grade 40 steel with galvanized steel zinc coating in conformance with ASTM A653/A653M and ASTM A924/A924M. Fill slat cavities with CFC free, foamed in place polyurethane insulation

having an R value of 7.7 and an STC 21. Air leakage is less than 1 CFM per square foot. Provide steel curtain slats containing a minimum of 20 percent recycled content. Submit data identifying percentage of recycled content for steel curtain slats.

Fabricate doors from interlocking cold-rolled slats, with section profiles as specified, designed to withstand the specified wind loading. Ensure the provided slats are continuous without splices for the width of the door.

2.2.1.2 Curtain Bottom Bar

Install curtain bottom bars as pairs of angles or using extrusions from the manufacturer's standard steel extrusions not less than 2.0 by 2.0 inches by 0.188 inch. Ensure steel extrusions conform to ASTM A36/A36M. Galvanize angles and fasteners in accordance with ASTM A653/A653M and ASTM A924/A924M. Coat welds and abrasions with paint conforming to ASTM A780/A780M.

Provide two minimum 2 inch by 2 inch by 1/8 inch structural steel angles.

2.2.1.3 Endlocks (and Windlocks)

Provide endlocks of Grade B cast steel conforming to ASTM A47/A47M, galvanized in accordance with ASTM A153/A153M. Secure locks at every other curtain slat. In addition to endlocks, exterior doors which have a design wind load of more than 20 pounds per square foot, must have windlocks of manufacturer's standard design. Windlocks must prevent curtain from leaving guide because of deflection from wind pressure or other forces.

2.2.1.4 Weather Stripping

Provide a hood baffle inside the hood that is a minimum 1/16 inch thick sheet of vinyl, neoprene rubber or equivalent. Provide guide weather stripping that is a minimum 1/16 inch thick sheet of vinyl, neoprene rubber, or equivalent.

Provide bottom bar weather-stripping that is a minimum 1/16 inch thick sheet of vinyl, neoprene rubber, or equivalent.

2.2.1.5 Locking Devices

Provide a locking device assembly which includes cylinder lock, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

2.2.1.6 Safety Interlock

Equip power-operated doors with a safety interlock switch to disengage power supply when the door is locked, or provide an operator with an internal lock sensing device to prevent the door opening when the door is locked.

2.2.2 Hardware

Ensure that all hardware conforms to ASTM A153/A153M, ASTM A307, and ASTM F568M.

2.2.2.1 Guides

Fabricate curtain jamb guides from the manufacturer's standard angles or channels of same material and finish as curtain slats unless otherwise indicated. Ensure curtain operates smoothly. Slot bolt holes for track adjustment. Securely attach guides to adjoining construction with not less than 3/8 inch diameter bolts, spaced near each end and not over 30 inches apart.

Ensure guides are roll-formed steel channel bolted to angle or structural grade, three angle assembly of steel to form a slot of sufficient depth to retain curtains in guides to achieve 20 psf windload standard. Guides may be provided with integral windlock bars and removable bottom bar stops.

2.2.2.2 Hood

Provide a hood with a minimum 24-gauge galvanized sheet metal, flanged at top for attachment to header and flanged at bottom to provide longitudinal stiffness. The hood encloses the curtain coil and counterbalance mechanism.

Hoods for openings more than 12 feet in width must have intermediate support brackets to prevent excessive sag. Provide a weather baffle at the lintel or inside the hood of each exterior door.

2.2.3 Counterbalancing Mechanism

Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted, around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed or self-lubricating bearings for rotating members.

2.2.3.1 Brackets

Provide the manufacturer's standard mounting brackets with one located at each end of the counterbalance barrel conforming to ASTM A36/A36M. Provide brackets of hot-rolled steel.

2.2.3.2 Counterbalance Barrels

Curtain must roll up on a barrel supported at head of opening on brackets and be balanced by a torsion spring system in the barrel. Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, conforming to ASTM A53/A53M or equivalent. Ensure the barrel is of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats. Limit barrel deflection to not more than 0.03 inch per foot of span under full load.

a. Barrel

Provide steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.

b. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that effort to

operate manually operated units does not exceed 25 lbs. At least 80 percent of the door weight must be counterbalanced at any position. Provide wheel for applying and adjusting spring torque.

2.2.4 Electric Door Operators

Provide electrical wiring and door operating controls conforming to the applicable requirements of NFPA 70 and UL 325. The door manufacturer must furnish automatic control and safety devices, including extra flexible type SO cable and spring-loaded automatic takeup reel or equivalent device, as required for proper operation of the doors. Conduit, wiring, and mounting of controls are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

Electric door-operator assemblies need to be the sizes and capacities recommended and provided by the door manufacturer for specified doors. Furnish complete assemblies with electric motors and factory-prewired motor controls, starter, gear reduction units, solenoid-operated brakes, clutch, remote-control stations, manual or automatic control devices, and accessories as required for proper operation of the doors.

Design the operators so that motors may be removed without disturbing the limit-switch adjustment and affecting the emergency auxiliary operators.

Provide a manual operator of crank-gear or chain-gear mechanisms with a release clutch to permit manual operation of doors in case of power failure. Arrange the emergency manual operator so that it may be put into and out of operation from floor level, and its use does not affect the adjustment of the limit switches. Provide an electrical or mechanical device that automatically disconnects the motor from the operating mechanism when the emergency manual operating mechanism is engaged.

2.2.4.1 Electric Motors

Provide motors which are the high-starting-torque, reversible, constant-duty electrical type with overload protection of sufficient torque and horsepower to move the door in either direction from any position. Ensure they produce a door-travel speed of not less than 8 nor more than 12 inches per second without exceeding the horsepower rating.

Provide motors which conform to NEMA MG 1 designation, temperature rating, service factor, enclosure type, and efficiency to the requirements specified. Motors must be suitable for operation on current of the characteristics indicated. Install motors in approved locations.

2.2.4.2 Motor Bearings

Select bearings with bronze-sleeve or heavy-duty ball or roller antifriction type with full provisions for the type of thrust imposed by the specific duty load.

Pre-lubricate and factory seal bearings in motors less than 1/2 horsepower.

Equip motors coupled to worm-gear reduction units with either ball or roller bearings.

Equip bearings in motors 1/2 horsepower or larger with lubrication service fittings. Fit lubrication fittings with color-coded plastic or metal dust

caps.

In any motor, bearings that are lubricated at the factory for extended duty periods do not need to be lubricated for a given number of operating hours. Display this information on an appropriate tag or label on the motor with instructions for lubrication cycle maintenance.

2.2.4.3 Motor Starters, Controls, and Enclosures

Provide each door motor with: a factory-wired, unfused, disconnect switch; a reversing, across-the-line magnetic starter with thermal overload protection; 24-volt operating coils with a control transformer limit switch; and a safety interlock assembled in a NEMA ICS 6 type enclosure as specified herein. Ensure control equipment conforms to NEMA ICS 1 and NEMA ICS 2.

Provide adjustable switches, electrically interlocked with the motor controls and set to stop the door automatically at the fully open and fully closed position.

2.2.4.4 Control Enclosures

Provide control enclosures that conform to NEMA ICS 6 for NEMA Type 4and general purpose NEMA Type 1 as applicable to selected mounting locations.

2.2.4.5 Transformer

Provide starters with 230/460 to 115 volt control transformers with one secondary fuse when required to reduce the voltage on control circuits to 24volts or less. Provide a transformer conforming to NEMA ST 1.

2.2.4.6 Sensing-Edge Device

Provide each door with a pneumatic or electric sensing device that meets UL 325, extends the full width of the door, and is located within a U-section neoprene or rubber astragal, mounted on the bottom rail of the bottom door section. Device needs to immediately stop and reverse the door upon contact with an obstruction in the door opening or upon failure of the device or any component of the control system and cause the door to return to its user-defined open position. Any momentary door-closing circuit must be automatically locked out and the door must be operable manually or with constant pressure controls until the failure or damage has been corrected. A sensing device is not a substitute for a limit switch.

Connect sensing device to the control circuit through a retracting cord and reel.

2.2.4.7 Remote-Control Stations

Remote control stations must be at least 5 feet above the floor line, and all switches must be located so that the operator will have complete visibility of the door at all times. Provide interior remote control stations that are full-guarded, momentary-contact three-button, heavy-duty, surface-mounted NEMA ICS 6 type enclosures as specified. Mark buttons "OPEN," "CLOSE," and "STOP." The "OPEN" and "STOP" buttons must be of the type requiring only momentary pressure to operate. The "CLOSE" button must be of the type either requiring constant pressure to maintain the closing motion of the door or momentary pressure when installed with a

monitored entrapment detection device which, upon failure of the device or any component of the control system, cause the door to return to its full open position. When the door is in motion and the "STOP" button is pressed, ensure the door stops instantly and remains in the stopped position. From the stopped position, the door may then be operated in either direction by the "OPEN" or "CLOSE" buttons. When the door is in motion, and the "CLOSE" button of the constant pressure type is released, the door must stop and remain in the stop position or reverse to the user set up position; from the stop position, the door may then be operated in either direction by the "OPEN" or "CLOSE" buttons. Controls must be adjustable to automatically stop the doors at their fully open and closed positions. Open and closed positions must be readily adjustable.

Provide exterior control stations that are full-guarded, momentary-contact three-button standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosures, key-operated, with the same operating functions as specified herein for interior remote-control stations.

2.2.4.8 Speed-Reduction Units

Provide speed-reduction units consisting of hardened-steel worm and bronze worm gear assemblies or planetary gear reducers running in oil or grease and inside a sealed casing, coupled to the motor through a flexible coupling. Drive shafts need to rotate on ball- or roller-bearing assemblies that are integral with the unit.

Provide minimum ratings of speed reduction units in accordance with AGMA provisions for class of service.

Ground worm gears to provide accurate thread form; machine teeth for all other types of gearing. Surface harden all gears.

Provide antifriction type bearings equipped with oil seals.

2.2.4.9 Chain Drives

Provide roller chains that are a power-transmission series steel roller type conforming to ASME B29.400, with a minimum safety factor of 10 times the design load.

Heat-treat or otherwise harden roller-chain side bars, rollers, pins, and bushings.

Provide high-carbon steel chain sprockets with machine-cut hardened teeth, finished bore and keyseat, and hollow-head setscrews.

2.2.4.10 Brakes

Provide 360-degree shoe brakes or shoe and drum brakes. Ensure the brakes are solenoid-operated and electrically interlocked to the control circuit to set automatically when power is interrupted.

2.2.4.11 Clutches

Ensure clutches are friction type or adjustable centrifugal type.

2.2.4.12 Weather/Smoke Seal Sensing Edge

Provide automatic stop control by an automatic sensing switch within

neoprene astragal extending the full width of door bottom bar.

Provide an electric sensing edge device. Ensure the door immediately stops downward travel when contact occurs before door fully closes. Provide a self-monitoring sensing edge connection to the motor operator.

2.2.5 Surface Finishing

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Noticeable variations in the same metal component are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.2.5.1 Galvanized and Shop-Primed Finish

Surfaces specified must have a zinc coating, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. The galvanized coating must conform to ASTM A653/A653M, coating designation Z275 (G90), for steel sheets, except that hoods located on interior of the building may be Z180 (G60), and ASTM A123/A123M for iron and steel products. The weight of coatings for products must be as designated in Table I of ASTM A123/A123M for the thickness of base metal to be coated. The prime coat must be a type especially developed for materials treated by phosphates and adapted to application by dipping or spraying. Repair damaged zinc-coated surfaces by the materials and methods conforming to ASTM A780/A780M and spot prime. At the option of the Contractor, a two-part system including bonderizing, baked-on epoxy primer, and baked-on enamel top coat may be applied to slats and hoods before forming, in lieu of prime coat specified.

2.2.5.2 Baked-Enamel or Powder-Coat Finish

Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with the coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

Give galvalume steel and hot dipped galvanized steel sheet coil a pretreatment to enhance adhesion followed by a caustic etch or alkaline wash for cleaning and degreasing. Apply a phosphate spray or chromate conversion treatment to protect against humidity and corrosive chemicals. Furnish an acrylic, polyester baked enamel or powder coating treatment conforming AAMA 2603. Bake the treatment using a temperature and time relationship that ensures thorough curing and a tough, durable finish. Provide a one coat application that achieves a 0.8 mil thickness.

Overhead coiling door is Warm Gray, AMS 595A 26260 as indicated in the Marine Corps Air Station Cherry Point, Base Exterior Architectural Plan, Section 4.3. Submit overhead coiling door selections to the Architectural Review Board prior to making submittal.

PART 3 EXECUTION

3.1 INSTALLATION

Install overhead coiling door assembly, anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories in accordance

with approved detail drawings and manufacturer's written instructions. Upon completion of installation, ensure doors are free from all distortion.

Install overhead coiling doors, motors, hoods, and operators at the mounting locations as indicated for each door in the Contract Documents and as required by the manufacturer.

Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility and as required by the manufacturer.

3.2 ADJUSTING AND CLEANING

3.2.1 Acceptance Provisions

After installation, adjust the hardware and moving parts. Lubricate bearings and sliding parts as recommended by manufacturer to provide smooth operating functions for ease movement, free of warping, twisting, or distortion of the door assembly.

Adjust seals to provide a weather-tight fit around entire perimeter.

Engage a factory-authorized service representative to perform startup service and checks according to the manufacturer's written instructions.

Test the door opening and closing operation when activated by controls system. Adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Reset the door-closing mechanism after a successful test.

Test and make final adjustment of new doors at no additional cost to the Government.

3.2.1.1 Maintenance and Adjustment

Not more than 90 calendar days after completion and acceptance of the project, examine, lubricate, test, and re-adjust doors as required for proper operation.

3.2.1.2 Cleaning

Clean doors in accordance with manufacturer's approved instructions.

3.3 OVERHEAD DOOR HARDWARE SETS

Sceure Exterior Openings

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Door No. 210B
HWS-5    Exterior Overhead Door
                      1 each Insulated Curtain
                      1 each Door Control
   Section 08 71 00   1 each Power Supply
                      1 each DPDT Balanced          MIL
                         Magnetic Switch
         Note:  Furnish electric metallic tubing raceway, cabling,
                      equipment and programming to support connected
                      devices and operate overhead curtain components
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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08/18, 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.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330/E330M	(2014; R 2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E783	(2002; R 2018) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM E1424	(1991; R 2016) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.10 (2017) Power Operated Pedestrian Doors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2021) International Building Code

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-645 (Rev C; Notice 1) Primer, Paint, Zinc-Molybdate, Alkyd Type

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

Fabrication Drawings

SD-03 Product Data

Finish

Recycled Content of Aluminum Material; S

SD-06 Test Reports

Certified Test Reports

Deflection

Air Infiltration

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

SD-11 Closeout Submittals

Manufacturer's Product Warranty

1.3 QUALITY CONTROL

1.3.1 Qualifications

1.3.1.1 Installer Qualifications

Provide documentation of the installer's experience in performing the work specified in this section.

Ensure that the installers are specialized in work similar to that required for this project, and that they are acceptable to product manufacturer.

1.3.1.2 Manufacturer Qualifications

Ensure that manufacturers meet the requirements specified in this section and project drawings.

Ensure that the manufacturer is capable of providing field service representation during construction, approving acceptable installers and approving application methods.

1.3.2 Single-Source Responsibility

When aluminum entrances are part of a building enclosure system, that includes storefront framing, windows, a curtain wall system, and related products, provide building enclosure system products from a single-source manufacturer.

Use a single source manufacturer with sole responsibility for providing design, structural engineering, and custom fabrication for door portal systems and for supplying components, materials, and products. Do not use products provided from numerous sources for assembly at the site. Ensure that the following work items and components are fabricated or supplied by a single source are:

a. Door assemblies. Reference Section 08 11 16, ALUMINUM DOORS AND FRAMES.

b. Glazed walls.

c. Door operating hardware as scheduled in Section 08 11 16, ALUMINUM DOORS AND FRAMES. Reference Section 08 11 16, ALUMINUM DOORS AND FRAMES. Appurenant items are specified and procured in Section 08 71 00 DOOR HARDWARE and conveyed to the glazing trade for installation.

d. Glass as specified in Section 08 81 00 GLAZING.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Ordering

To avoid construction delays, comply with the manufacturer's lead-time requirements and instructions for ordering.

1.4.2 Packing, Shipping, Handling and Unloading

Deliver materials in the manufacturer's original, unopened, undamaged containers with identification labels intact.

1.4.3 Storage and Protection

Store materials in a way that protects them from exposure to harmful weather conditions. Avoid damaging the storefront material and components during handling. Protect storefront material against damage from elements, construction activities, and other hazards before, during, and after storefront installation.

Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sunlight. Do not leave coating residue on surfaces.

1.5 PROJECT / SITE CONDITIONS

1.5.1 Field Measurements

Verify actual measurements or openings by taking field measurements before fabrication; record these measurements on shop drawings. To avoid construction delays, coordinate field measurements, and fabrication schedule with construction progress.

1.6 WARRANTY

Provide a written manufacturer's warranty, executed by a company official, warranting against defects in materials and products for 2 years from the date of shipment. Warrant that the door corner construction is for the life of the project. Provide a written installer's warranty, warranting work to be watertight and free from defective materials, defective workmanship, and glass breakage as a result of defective design, and agreeing to replace components that fail within 2 years.

The warranty states the following:

a. Watertight and airtight system installation is completed within specified tolerances.

b. The completed installation remains free of rattles, wind whistles and noise caused by thermal movement and wind pressure.

c. System is structurally sound and free from distortion.

d. Glass and glazing gaskets will not break or "pop" from frames as a result of design, wind load pressure, movement caused by expansion or contraction, or structural loading.

e. Glazing sealants and gaskets remain free of abnormal deterioration or dislocation as a result of sunlight, weather, or oxidation.

Provide written warranty stating that the organic coating finish will not fade more than 10 percent or show chalking, yellowing, peeling, cracking, pitting, corroding or variations in color, or gloss deterioration beyond the manufacturer's descriptive standards for 20 years from the shipment date and agreeing to promptly correct defects.

Provide a written thermal integrity warranty for 2 years from ship date against thermal barrier system failure resulting from the following:

a. Longitudinal and transverse thermal barrier shrinkage.

b. Thermal barrier cracking.

c. Structural failure of the thermal barrier material.

d. Loss of adhesion or loss of prescribed edge pressure on glazing material, resulting in excessive air and water infiltration.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design Requirements for Aluminum (Entrances and Components)

Provide a door portal system designed to withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects.

a. Dead and Live Loads: Determined by ASCE 7-16 and calculated in accordance with applicable codes.

b. Seismic Loads: Design and install the system to comply with the seismic requirements for the project location in accordance with Section 1613 of the International Building Code, ICC IBC.

d. Thermal Loads And Movement:

(1) Ambient Temperature Range: 120 degrees F

(2) Material Surfaces Range: 180 degrees F

2.1.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

2.1.1.2 Recycled Content

Provide aluminum framed entrances and storefronts that have a minimum of 20 percent recycled content based upon the aluminum billet used in the original material. Provide data indicating percentage of recycled content of aluminum material.

2.1.1.3 Sealants

Provide either ethylene propylene diene monomer (EPDM) elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

Internal Sealants: Provide sealants that according to the manufacturer will remain permanently elastic, tacky, non-drying, non-migrating, and weather tight.

2.2 FABRICATION

Provide the following information when submitting fabrication drawings for custom fabrications:

a. Indicate elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, and member connections.

b. Show the following items:

(1) Details of special shapes.

(2) Reinforcing.

(3) Anchorage system.

(4) Interfacing with building construction.

(5) Provisions for expansion and contraction.

c. Indicate typical glazing details, locations of various types and thickness of glass and internal sealant requirements as recommended by the sealant manufacturer.

d. Clearly indicate locations of exposed fasteners and joints.

e. Clearly show where and how the manufacturer's system deviates from Contract drawings and these specifications.

2.2.1 Entrance System Fabrication

Accurately fit and secure joints and corners. Make joints hairline in appearance. Remove burrs and smooth edges. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments so that they are concealed from view.

Separate dissimilar metals with protective coating or pre-formed separators to prevent contact and corrosion.

2.2.2 Shop Assembly

Fabricate and assemble units with joints only at the intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

2.2.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by the manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected by the Contacting Officer.

2.2.3 Finish

Before fabrication, clean the units and give them a AA-M-10-C22-A42 (color) anodized finish in accordance with the requirements of the AA DAF45.

Give aluminum extrusions a pretreatment to enhance adhesion followed by a caustic etch or alkaline wash for cleaning and degreasing. Apply a phosphate spray or chromate conversion treatment to protect against humidity and corrosive chemicals. Furnish an anodized treatment conforming to AAMA 611 to obtain an architectural Class I coating. Provide a two coat application that achieves a 0.7 mil thickness.

Aluminum storefront is Clear Anodized.

2.2.4 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum

members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

Fabricate aluminum entrances in accordance with the entrance manufacturer's prescribed tolerances.

2.2.4.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.2.4.2 Maximum Offset at Consecutive Members

1/64 inch in alignment between two consecutive members in line, end to end.

2.2.4.3 Maximum Offset at Glazing Pocket Corners

1/64 inch between framing members at glazing pocket corners.

2.2.4.4 Joints

Between adjacent members in same assembly: Joints are hairline and square to the adjacent member.

2.2.4.5 Variation

In squaring diagonals for fabricated assemblies: 1/16 inch.

2.2.4.6 Flatness

For fabricated assemblies: plus/minus 1/16 inch of neutral plane.

2.3 MATERIALS

2.3.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure that all sealants conform to AAMA 800.

2.3.2 Glass

Refer to Section 08 81 00 GLAZING.

2.4 ACCESSORIES

2.4.1 Fasteners

Provide stainless steel fasteners colored to match substrates encountered in areas where the fasteners are exposed.

Use non-corrosive and compatible fasteners with components being fastened. Do not use exposed fasteners, except where unavoidable for application of hardware.

In areas where fasteners are not exposed, use aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer.

For exposed locations, provide countersunk Phillips head screws when items with a matching finish are fastened. For concealed locations, provide the

manufacturer's standard fasteners.

Provide nuts or washers that have been designed with a means to prevent disengagement; do not deform fastener threads.

2.4.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4.2.1 Inserts and Anchorage Devices

Provide manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars, or tubes. Shop-coat steel assemblies after fabrication with an alkyd zinc chromate primer complying with FS TT-P-645.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify that the condition of substrate previously installed under other sections is acceptable for product installation in accordance with the manufacturer's instructions.

Verify that openings are sized to receive the storefront system and that the sill plate is level in accordance with the manufacturer's acceptable tolerances.

3.2 PREPARATION

Field-verify dimensions before fabricating components for the door portal assembly.

Coordinate the erection of door portal with installation of surrounding glass wall and door assemblies. Ensure that the door portals can provide support and anchorage for assembly components.

Coordinate electrical requirements for doors to ensure proper power source, conduit, wiring, and boxes.

3.2.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.3 INSTALLATION

Submit installation drawings for review and approval.

Install the entrance system in accordance with the manufacturer's instructions and the AAMA storefront and entrance guide specifications

manual. Attach the entrance system to the structure, allowing it to be adjusted to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten the system to the building structure. Align the assembly so that it is plumb and level, and free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

3.3.1 Tolerances

Ensure that tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by the Aluminum Association.

3.3.2 Related Products Installation Requirements

3.3.2.1 Sealants (Perimeter)

Refer to Section 07 92 00 JOINT SEALANTS.

3.3.2.2 Glass

Refer to Section 08 81 00 GLAZING.

3.4 FIELD QUALITY CONTROL

3.4.1 Air Infiltration

Test air infiltration in accordance with ASTM E783

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. For single-acting offset pivot, butt hung, or continuous geared hinge entrances in the closed and locked position, test the specimen in accordance with ANSI/BHMA A156.10, and ASTM E283 at a pressure differential of 1.57 psf for pairs of doors; ensure that maximum infiltration for a pair of 7 foot by 8 foot entrance doors and frame is 1.2 cfm/square foot.

b. Ensure the maximum allowable infiltration for a completed storefront system does not exceed 0.06 cfm/square foot when tested in accordance with ASTM E1424 at a differential static pressure of 6.24 psf.

3.4.2 Deflection

Submit certified test reports showing that the maximum allowable deflection in a member when tested in accordance with ASTM E330/E330M with allowable stress is L/175 or 3/4 inches maximum.

3.5 ADJUSTING AND CLEANING

3.5.1 Protection

Protect the installed product's finish surfaces from damage during construction. Protect the aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

3.5.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before acceptance remove excess mastic, mastic smears, and other foreign materials. Remove construction debris from the project site and legally dispose of this debris.

3.6 WARRANTY

Submit 3 signed copies of the manufacturer's product warranty for the entrance system as follows:

a. Stipulate warranty periods as stated in paragraphs describing WARRANTY in Part 1 above.

Ensure that the Warranty's language is identical to the "As Approved" version of the sample warranty submitted to and returned from the Contracting Officer.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE
02/16, CHG 4: 02/22

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.

ASTM INTERNATIONAL (ASTM)

ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2021) Butts and Hinges
ANSI/BHMA A156.2	(2022) Bored and Preassembled Locks and Latches
ANSI/BHMA A156.3	(2020) Exit Devices
ANSI/BHMA A156.4	(2024) Door Controls - Closers
ANSI/BHMA A156.5	(2020) Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	(2021) Architectural Door Trim
ANSI/BHMA A156.7	(2016) Template Hinge Dimensions
ANSI/BHMA A156.8	(2021) Door Controls - Overhead Stops and Holders
ANSI/BHMA A156.13	(2022) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.16	(2023) Auxiliary Hardware
ANSI/BHMA A156.18	(2020) Materials and Finishes
ANSI/BHMA A156.21	(2019) Thresholds
ANSI/BHMA A156.22	(2021) Gasketing
ANSI/BHMA A156.25	(2013) Electrified Locking Devices
ANSI/BHMA A156.31	(2013) Electric Strikes and Frame Mounted Actuators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 80	(2022) Standard for Fire Doors and Other Opening Protectives
NFPA 101	(2024) Life Safety Code
NFPA 252	(2022) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2023) Specifications for Standard Steel Doors and Frames

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 all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Detail Drawings

Verification of Existing Conditions

Hardware Schedule

Keying System

SD-03 Product Data

Hardware Items

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1

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. Indicate power components and wiring coordination for electrified hardware. 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

Provide Hardware Item List and Hardware Schedule containing the following information, and additional information as needed to identify the complete make up of each hardware set and its application to each opening:

1.5.1 Hardware Item List:

a. Hardware Type

b. Item Number

c. Quantity

d. Size(s)

e. Reference Publication / Type Number

f. Manufacturer's Name / Catalog Number

g. Key Control Symbols

h. UL Mark (If fire rated and listed)

i. BHMA Finish(es)

j. Remarks

1.5.2 Hardware Schedule

a. Hardware Set Number

b. Opening Number(s)

c. Opening Description (single/double leaf, hand, size, door/frame material)

d. Fire Rating

e. Sound Rating

f. Hardware Items

g. Quantity

h. Size

i. BHMA Finish

j. Remarks

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 (e.g. AA1 and AA2).

b. Complete listing of all key cuts (AA1-123456, AA2-123458).

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.

Coordinate with the Cherry Point Base Locksmith to resolve keying, procurement, shipping and installation procedures. Confirm keyways utilized and provide compatible cylinders and cores. Confirm hardware set components and functions.

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 doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 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 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, locks, latches, 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.

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch 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 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.

2.3.2.1 Bored Locks and Latches

Provide in accordance with ANSI/BHMA A156.2, Series 4000, Grade 1.

2.3.3 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.Lever s of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.4 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

2.3.4.1 Electric Strikes and Frame Mounted Actuators

Provide in accordance with ANSI/BHMA A156.31, Grade 1. 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 2300 pounds.

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.

2.3.4.1.1 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.

2.3.4.1.2 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.

2.3.4.1.3 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.

2.3.4.1.4 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.

2.3.4.2 Balanced Magnetic Switch

Balanced magnetic switch utilizes three Form C, high reliability Rhodium plated reed switches encapsulated in epoxy inside a recessed mounted fire retardant case. One switch is of a different sensitivity, creating a double pole, double throw magnetic tamper. When the rare earth magnet is in place and balanced, the magnetic tamper switch is in a state opposite to the other two switches. This normal configuration changes for the following occurrences:

1. Switches 1 and 3 will change state by either the deliberate shunting of the magnetic field or if the door is opened
2. Switch 2 will change state with the addition of a magnetic field, such as an external magnet

End of the line resistors may be incorporated to allow a predetermined trickle of current to flow, permitting operation from a continuously supervised line. Housings are solid aluminum that allow a gap ranging from 0 to 0.5 inches. Actuators are 3.5 inches in length by 1.25 inches in width by 0.625 inches in thickness. Switches are 3.5 inches in length by 1.25 inches in width by 0.625 inches in thickness.

2.3.4.3 Card Readers and Keypad Access Control Hardware

Provide in accordance with ANSI/BHMA A156.5 and ANSI/BHMA A156.25, Grade 1 components. Provide devices that are tamper alarmed, tamper and vandal resistant, solid state, and do not contain electronics which could compromise the access control subsystem should the subsystem be attacked. Provide surface mountable devices for each individual location. Each device to contain a visual display, either mounted on the face, or on an integral part of the device, to indicate access or exit request processing, request approval, and request denial. Provide proximity type card readers capable of reading proximity type access control cards. Provide keypads that contain an integral 12-digit tactile keyboard with digits arranged in numerical order. Provide keypads that are a standalone device.

Provide card readers and keypads that interface with access contol systems encountered.

2.3.5 Keying System

Provide an extension of the existing keying system. Existing locks Series 7 pin, A Keyway as manufactured by Best, www.bestaccess.com and have interchangeable cores. Provide construction interchangeable cores. Provide key cabinet as specified.

2.3.6 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.6.1 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 ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

2.3.7 Keys

Furnish one file key, one duplicate key, and one working key for each key change . Furnish one additional working key for each lock of each keyed-alike group. Furnish construction master keys, and control keys for removable cores. Furnish a quantity of key blanks equal to 20 percent of the total number of file keys. Stamp each key with appropriate key control symbol and "U.S. property - do not duplicate." Do not place room number on keys.

2.3.8 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

2.3.9 Automatic Flush Bolts

Automatic flush bolt face plates measure 1 inch by 6.75 inches. The thermal lock secures the inactive door automatically under high heat and fire conditions. Bolts are installed at both the top and the bottom of the inactive door. Automatic flush bolts are released by opening the active leaf. The assembly is UL approved.

2.3.10 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full metal covers 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.

2.3.10.1 Closer and Coordinator

Surface applied door closer and coordinators have two separate temperature compensating, non critical adjustment valves to control sweep and latch closing speeds. An adjustable hydraulic backcheck is effective from a 65? door position. Adjustable delayed action is effective from 125 through 70 degree door positions. The closer is a field adjustable, spring powered size complying with barrier free opening force requirements. The coordinator mechanism controls sequential closing for pairs of doors. Closers are non handed and installed on the pull side of the doors.

2.3.10.2 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.

2.3.11 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.12 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

2.3.12.1 Sizes of Armor, Mop and Kick Plates

2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 8 inch kick plates for flush doors. Provide a minimum 34 inch armor plates for flush doors andcompletely cover lower panels of panel doors. Provide 4 inch mop plates.

2.3.13 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.14 Edge Seals

Edge seal gasket extrusions consist of 0.5 inch by 0.5 inch intumescent, semi rigid gasketing with pressure sensitive adhesive backing for corner mounting between jambs and stops. Provide edge seal gaskets for doors certified in accordance with Category B, positive pressure fire door testing. Each leg end has a 0.25 inch flexible blade that receives the door edge. Assemblies are Category J gasketing approved for listed steel frames, classified steel covered composite and hollow metal doors rated up to and including 3 hours. Provide gasketing complying with NFPA 80 for fire rated openings encountered. Gasketing complies with ANSI 156.22, UL 1784 and UL 10C.

2.3.15 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.16 Weatherstripping Gasketing

Provide in accordance with ANSI/BHMA A156.22. 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 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weatherstripping with one of the following:

2.3.16.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.17 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 0.08 inch thick, clear anodized finish. Provide rain drips with a 2 inch 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.

2.3.17.1 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.3.18 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.3.19 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. 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 ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide hinges for doors in stainless steel with BHMA 630 finish.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5, 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 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 stainless steel sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 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 in expansion sleeves. 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 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies.

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless 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 scheduled hardware items for other doors under this section. Deliver Hardware templates and hardware, except field applied hardware, to the other door and frame manufacturer for use in fabricating doors and frames.

3.6.1 DOOR HARDWARE SCHEDULE

Location of Hardware Sets	HWS
Section 08 11 16, Aluminum Doors and Frames	1-2
Section 08 33 13, Coiling Counter Doors	3-4
Section 08 33 23, Steel Overhead Coiling Doors	5
Section 08 71 00, Door Hardware	6-21
Section 10 22 13, Wire Mesh Partitions	22
Section 11 13 30, Top of Ground Dock Lift	23

AC = Access Control; BB = Ball Bearing; DPDT = Double Pole, Double Throw; FMC = Full Metal Cover; GFGI = Government Furnished, Government Installed; LHR = Left Hand Reverse; MIL = Mill Finished Aluminum; NRP = Non Removable Pin; RHR = Right Hand Reverse; SFIC = Small Format Interchangeable Core

HARDWARE SETS

Secure Exterior Openings

Door No. 210A, 211A
HWS-6 Exterior Entrance

	3 each BB 4.5 x 4.5 Butt Hinge, NRP, A5111	630
	1 each FMC Closer, C02231 with spring stop, stop mounted slide track arm push side mount	630
	1 each Lever Entry, F109	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	1 each 40" Drip Ledge	MIL
	1 each 3070 Weatherstrip	MIL
	1 each 36" Bottom Sweep with Drip	MIL
	1 each 36" Threshold, J35100	MIL
	1 each Floor Stop, L02131	626
Section 08 71 00	1 each Power Supply	
Section 08 71 00	1 each DPDT Balanced Magnetic Switch	MIL

Note: Furnish electric metallic tubing raceway, cabling, equipment and programming to support connected devices and operate access control components

Secure Non Rated Openings

Door No, 202
HWS-7 AC Tel Com

	3 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each Overhead Door Holder, C02511 jamb mounted slide track arm, pull side mount	626
	1 each Lever Storeroom, F86	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	3 each Silencer, L03011	Grey
	1 each Wall Stop, L02251 or Floor Stop, L02161	626
Section 08 71 00	1 each Power Supply	
Section 08 71 00	1 each DPDT Balanced Magnetic Switch	MIL
Section 08 71 00	1 each Electric Strike	630
Section 08 71 00	1 each Card Reader, Wall Mounted	Black

Note: Furnish electric metallic tubing raceway, cabling, equipment and programming to support connected devices and operate access control components

Note: Trim is to have an abrasive texture to indicate a potentially hazardous environment to the blind

Note: Access control equipment is located in Comm 202

Door No. 205A
HWS-8 Suite

	3 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each FMC Closer, C02231 with track hold open, soffit mounted slide track arm, push side mount	630
	1 each Lever Entry, F109	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	3 each Silencer, L03011	Grey
	1 each Wall Stop, L02251 or Floor Stop, L02161	626

Section 08 71 00	1 each Power Supply	
Section 08 71 00	1 each DPDT Balanced Magnetic Switch	MIL

Note: Furnish electric metallic tubing raceway, cabling, equipment and programming to support connected devices and operate access control components

Heavy Duty Non Rated Openings

Door No. 210C
HWS-9 Warehouse Pair

	6 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	2 each FMC Closer, C02231 with track hold open, soffit mounted slide track arm, push side mount	630
Active Leaf RHR		
	1 each Lever Entry, F109	630
Best	1 each 7 Pin SFIC, F24, E09241	630
Inactive Leaf LHR		
	2 each 12" Lever Ext Flush Bolt, L14251	626
	1 each Dust Proof Strike, L04021	626
	4 each 32 x 34 Beveled Armor Plate, J101	630
	2 each Silencer, L03011	Grey
	2 each Wall Stop, L02251 or Floor Stop, L02161	626

Door No. 221
HWS-10 Mechanical

	2 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each Overhead Door Holder, C02511 stop mounted slide track arm, push side mount	626
	1 each Lever Storeroom, F86	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	2 each Silencer, L03011	Grey

Note: Trim is to have an abrasive texture to indicate a potentially hazardous environment to the blind

Door No. 207, 209
HWS-11 Head

	3 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each FMC Closer, C02021	630
	1 each Lever Privacy, F22 no SFIC	630
	1 each 8 x 34 Beveled Kick Plate, J102	630
	1 each 4 x 34 Beveled Mop Plate, J103	630
	3 each Silencer, L03011	Grey
	1 each Wall Stop, L02251 or Floor Stop, L02161	626

Door No, 208
HWS-12 Janitor

	3 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each FMC Closer, C02021	630
	1 each Lever Storeroom, F86	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	1 each 8 x 34 Beveled Kick Plate, J102	630
	1 each 4 x 34 Beveled Mop Plate, J103	630
	3 each Silencer, L03011	Grey
	1 each Wall Stop, L02251 or	626

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                      Floor Stop, L02161
                    1 each Lever Door Holder, L01381              626
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Note: Trim is to have an abrasive texture to indicate a potentially hazardous environment to the blind

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Door No. 211B, 214, 215, 216
HWS-13 Office
                    3 each BB 4.5 x 4.5 Butt Hinge, A5111         630
                    1 each Lever Entry, F109                      630
   Best             1 each 7 Pin SFIC, F24, E09241                630
                    3 each Silencer, L03011                       Grey
                    1 each Wall Stop, L02251 or                   626
                      Floor Stop, L02161

Door No. 217
HWS-14 Conference
                    3 each BB 4.5 x 4.5 Butt Hinge, A5111         630
                    1 each Lever Passage, F01                     630
                      no SFIC
                    3 each Silencer, L03011                       Grey
                    1 each Wall Stop, L02251 or                   626
                      Floor Stop, L02161

Door No. 206, 212, 213, 220A, 220B
HWS-15 Common Area Storage
                    3 each BB 4.5 x 4.5 Butt Hinge, A5111         630
                    1 each FMC Closer, C02021                     630
                    1 each Lever Storeroom, F86                   630
   Best             1 each 7 Pin SFIC, F24, E09241                630
                    3 each Silencer, L03011                       Grey
                    1 each Wall Stop, L02251 or                   626
                      Floor Stop, L02161

Door No. 203
HWS-16 ATM
                     3 each BB 4.5 x 4.5 Butt Hinge, A5111        630
                     1 each FMC Closer, C02021                    630
                     1 each Lever Passage, F01                    630
                       no SFIC
                     3 each Silencer, L03011                      Grey
                     1 each Wall Stop, L02251 or                  626
                       Floor Stop, L02161
```

Heavy Duty 45 Minute Rated Openings

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Door No. 103F
HWS-17 Warehouse Pair, 45 Min Rating
                    6 each BB 4.5 x 4.5 Butt Hinge, A5111         630
                    1 each Closer and Coordinator                 630
                      push side mount
      Active Leaf RHR
                    1 each Lever Entry, F109                      630
   Best             1 each 7 Pin SFIC, F24, E09241                630
      Inactive Leaf LHR
Section 08 11 13    1 each Flat Overlapping Astragal            Primed Steel
                    1 each Automatic Flush Bolt Set, Type 25      630
                    1 each Dust Proof Strike, L04021              626
                    4 each 32 x 34 Beveled Armor Plate, J101      630
                    1 each 6070 Category B Edge Seal, UL 10C      Charcoal
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	1 each Astragal Edge Seal, UL 10C	Charcoal
	2 each Wall Stop, L02251 or Floor Stop, L02161	626

Door No. 113
HWS-18 Warehouse Uneven Pair, 45 Min Rtg

	6 each BB 4.5 x 4.5 Butt Hinge, NRP, A5111	630
	1 each Closer and Coordinator push side mount 3070 Active Leaf RHR	630
	1 each Lever Entry, F109	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	2 each 32 x 34 Beveled Armor Plate, J101	630
Section 08 11 13	1 each Flat Overlapping Astragal 2870 Inactive Leaf LHR	Galvanealed
	1 each Automatic Flush Bolt Set, Type 25	630
	1 each Dustproof Strike, L04021	626
	2 each 28 x 34 Beveled Armor Plate, J101	630
	1 each 5870 Category B Edge Seal, UL 10C	Charcoal
	1 each Astragal Edge Seal, UL 10C	Charcoal
	2 each Wall Stop, L02251 or Floor Stop, L02161	626

Door No. 154
HWS-19 Warehouse Uneven Pair, 45 Min Rtg

	6 each BB 4.5 x 4.5 Butt Hinge, NRP, A5111	630
	1 each Closer and Coordinator push side mount 30711 Active Leaf RHR	630
	1 each Lever Entry, F109	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	2 each 32 x 34 Beveled Armor Plate, J101	630
Section 08 11 13	1 each Flat Overlapping Astragal 211711 Inactive Leaf LHR	Galvanealed
	1 each Automatic Flush Bolt Set, Type 25	630
	1 each Dustproof Strike, L04021	626
	2 each 31 x 34 Beveled Armor Plate, J101	630
	1 each 511711 Category B Edge Seal, UL 10C	Charcoal
	1 each Astragal Edge Seal, UL 10C	Charcoal
	2 each Wall Stop, L02251 or Floor Stop, L02161	626

Door No. 122C
HWS-20 Office, 45 Minute Rating

	3 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each FMC Closer, C02021	630
	1 each Lever Entry, F04	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	1 each 3070 Category B Edge Seal, UL 10C	Charcoal
	1 each Wall Stop, L02251 or Floor Stop, L02161	626

Door No. 123B, 124, 155
HWS-21 Warehouse Storage, 45 Min Rtg

	3 each BB 4.5 x 4.5 Butt Hinge, A5111	630
	1 each FMC Closer, C02021	630
	1 each Lever Storeroom, F86	630
Best	1 each 7 Pin SFIC, F24, E09241	630
	2 each 32 x 34 Beveled Armor Plate, J101	630

1 each 3070 Category B Edge Seal, UL 10C	Charcoal
1 each Wall Stop, L02251 or Floor Stop, L02161	626

-- End of Section --

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specifiaction for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C920	(2018; R 2024) Standard Specification for Elastomeric Joint Sealants
ASTM C1021	(2008; R 2014) Standard Practice for Laboratories Engaged in Testing of Building Sealants
ASTM C1036	(2021) Standard Specification for Flat Glass
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM C1087	(2016) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
ASTM C1281	(2016) Standard Specification for Preformed Tape Sealants for Glazing Applications
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

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 all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Glazing Accessories

Sealants

Joint Backer

SD-04 Samples

Glazing Tape

Sealing Tapes

SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting

1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement 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 ANSI Z97.1.

1.4 QUALITY CONTROL

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 above40 degrees F 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

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

2.2 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.2.1 Clear Glass

For interior glazing (i.e., pass and observation windows), 1/4 inch thick, tempered, Clear glass should be used.

2.2.2 Tempered Glass

ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 2 (tinted heat absorbing), Quality q3, 0.25 inch thick..

2.3 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, 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 testing agency qualified according to ASTM C1021.

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

2.3.1 Sealants

Provide elastomeric sealants.

2.3.1.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes. Color of sealant must be white.

2.3.2 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.

2.3.3 Glazing Tapes

2.3.3.1 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 ASTM C1281 and AAMA 800 for products indicated below:

a. AAMA 804.3 tape, where indicated.

b. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

c. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.3.4 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. 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.

2.3.5 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). 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.

2.3.6 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 ASTM C1087 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 the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, 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. 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 the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. 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 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, 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. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

-- End of Section --

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SECTION 09 22 00

SUPPORTS FOR GYPSUM BOARD
02/10, CHG 2: 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.

ASTM INTERNATIONAL (ASTM)

ASTM A463/A463M	(2015; R 2020; E 2020) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C645	(2014; E 2015) Nonstructural Steel Framing Members
ASTM C754	(2020) Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Metal Support Systems

Recycled Content for Metal Support Systems; S

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations permitting easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60; aluminum coating ASTM A463/A463M, T1-25; or a 55-percent aluminum-zinc coating.

Provide metal support systems containing a minimum of 20 percent recycled content. Provide data identifying percentage of recycled content for metal support systems.

2.1.1 Materials for Attachment of Gypsum Wallboard

2.1.1.1 Suspended Ceiling Systems

ASTM C645.

Suspended ceiling assemblies consist of main runners or carrying channels that are 0.060 inch, 16 gauge cold rolled channels 1.5 inches deep with 0.5 inch flanges. Cross furring members are 0.048 inch, 18 gauge cold rolled channels 0.875 inches deep with 0.5 inch flanges. Cross furring members attach to main runners with 18 gauge galvanized tie wire or prefabricated clips. Suspend ceiling assemblies with 0.106 inch, 12 gauge hangers. Specified parameters are minimums. Provide recommended gauges, cross section dimensions, spacing, wire gauges, hanger patterns and fastener patterns.

2.1.1.2 Non-load Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.033 inch thickness for receiving abuse resistant gypsum board

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Gypsum Wallboard

3.1.1.1 Suspended Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.1.2 Non-load Bearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.2 ERECTION TOLERANCES

Provide framing members which will be covered by finish materials such as wallboard within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/4 inch in 8 feet from a straight line;

c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/4 inch in 8 feet from a true plane.

Provide framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/8 inch in 8 feet from a straight line;

c. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

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SECTION 09 29 00

GYPSUM BOARD
08/16, CHG 4: 02/20

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 A108.11	(1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C475/C475M	(2017; R 2022) Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C840	(2020) Standard Specification for Application and Finishing of Gypsum Board
ASTM C954	(2018) Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM C1002	(2020) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM C1047	(2019) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM C1629/C1629M	(2018a) Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
ASTM D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
ASTM D2394	(2017) Standard Test Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring

ASTM D3273	(2021) Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
ASTM D5420	(2016) Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Strike Impacted by a Falling Weight (Gardner Impact)
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E695	(2003; R 2015; E 2015) Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish
GA 216	(2010) Application and Finishing of Gypsum Panel Products

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for all submittal. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious Backer Units

Abuse Resistant Gypsum Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

Gypsum Board

Recycled Content for Gypsum Board; S

Recycled Content for Paper Facing and Gypsum Cores; S

VOC Content of Joint Compound; S

SD-06 Test Reports

SD-07 Certificates

Asbestos Free Materials

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

Indoor Air Quality for Gypsum Board; S

SD-08 Manufacturer's Instructions

Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer Maintenance Instructions

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Ceiling and Wall Systems

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 program 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 in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.4.2 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 offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have visible moisture or biological growth.

1.4.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

1.6 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.

1.7 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 50 degrees F and not more than 80 degrees F 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 3 to 4 inches. 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 20 degrees F 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.

1.8 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, cementitious backing unitsand 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

ASTM C1396/C1396M. Gypsum board must contain a minimum of 10 percent post-consumer recycled content, or a minimum of 40 percent post-industrial recycled content. Provide data identifying percentage of recycled content for gypsum board. Paper facings must contain a minimum of 100 percent recycled paper content. Gypsum cores must contain a minimum of 95 percent post-industrial recycled gypsum content. Provide data identifying percentage of recycled content for paper facing and gypsum cores. Provide gypsum wall board and panels meeting 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 gypsum board.

2.1.1.1 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.2 Mold Resistant / Anti-Microbial Gypsum

ASTM D3273. 48 inch wide, 5/8 inch thick, tapered edges. Provide moisture resistant gypsum board in toilet rooms.

2.1.2 Abuse Resistant Gypsum Board

48 inch wide, 5/8 inch thick, tapered edges.
Reinforced gypsum panel with imbedded fiber mesh or lexan backing tested in accordance with the following tests. Hard body impact test must attain a Level 2 performance in accordance with ASTM C1629/C1629M. Provide fasteners that meet manufacturer requirements and specifications stated within this section. Abuse resistant gypsum board, when tested in accordance with ASTM E84, have a flame spread rating of 75 or less and a smoke developed rating of 100 or less.

2.1.2.1 Soft Body Impact Test

ASTM E695 or ASTM D2394 for impact penetration and deformation. ASTM E695 using a 60 lb leather bag filled with steel pellets, resisting no less than 300 ft. lb. cumulative impact energy before failure or ASTM D2394 using 5.5 inch hemispherical projectile resisting no less than 264 ft. lb. before failure. Provide test specimen stud spacing a minimum 16 inch on center.

2.1.2.2 Hard Body Impact Test

Comply with hard body impact test in accordance with ASTM C1629/C1629M Classification Level 2.

2.1.2.3 Surface Abrasion Test

Comply with test surface abrasion test in accordance with ASTM C1629/C1629M.

2.1.2.4 Indentation Test

ASTM D5420 or ASTM D1037 for indentation resistance. ASTM D5420 using a 32 oz weight with a 5/8 inch hemispherical impacting head dropped once 3 feet creating not more than 0.137 inch indentation or ASTM D1037 using no less than 470 lb weight applied to the 0.438 inch diameter ball to create not more than a 0.0197 inch indentation depth.

2.1.3 Cementitious Backer Units

In accordance with the Tile Council of America (TCA) Handbook.

2.1.4 Joint Treatment Materials

ASTM C475/C475M. 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.

2.1.4.1 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.4.2 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.5 Fasteners

2.1.5.1 Screws

ASTM C1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.6 Accessories

ASTM C1047. 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.

2.1.7 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 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 ASTM C840 or GA 216 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. Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

3.2.2 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C840, System XIII or GA 216.

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 in accordance with ANSI A108.11. Place a 15 lb 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 6 inch overlap of sheets laid shingle style.

3.3.2 Joint Treatment

ANSI A108.11.

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C840, GA 214 and GA 216. Finish above ceilings to Level 1 in accordance with GA 214. Unless otherwise specified, finish all gypsum board to Level 5 in accordance with GA 214. 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 GA 214 Level 5. In accordance with GA 214 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.

3.5 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.

3.6 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. Joints of fire-rated gypsum board enclosures must be closed and sealed in accordance with UL test requirements or GA requirements. 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.

-- End of Section --

SECTION 09 30 10

CERAMIC TILING
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 A108.02	(2016) General Requirements: Materials, Environmental, and Workmanship.
ANSI A108.5	Installation of ceramic tile with dry-set portland cement mortar or latex -portland cement mortar
ANSI A108.10	Installation of grout in tilework
ANSI A118.3	American national standard specifications for chemical resistant, water cleanable tile-setting and grouting epoxy and water cleanable tile-setting epoxy adhesive
ANSI A118.4	American national standard specifications for chemical resistant, water cleanable tile-setting and grout epoxy and water cleanable tile-setting epoxy adhesive
ANSI A118.10	American national standard speciications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation
ANSI A136.1	(2008) American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile
ANSI A137.1	(2019) American National Standards Specifications for Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C1027	(2009; R 2017) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C150/C150M	(2024) Standard Specification for Portland Cement
ASTM C373	(2018; R 2023)Standard Test Methods for Determination of Water Absorption and

	Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products
ASTM C648	(2020) Standard Test Method for Breaking Strength of Ceramic Tile

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) 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

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk	(2017) Handbook for Ceramic, Glass, and Stone Tile Installation

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 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Porcelain Tile

Setting-Bed

Mortar, Grout, and Adhesive

SD-04 Samples

Tile

Accessories

Transition Strips

Grout

SD-07 Certificates

Indoor Air Quality for Adhesives

Indoor Air Quality for Sealants

SD-08 Manufacturer's Instructions

Maintenance Instructions

SD-10 Operation and Maintenance Data

Installation

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 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 requirments cited in this Section.

1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years experience with a company specializing in performing the type of work described. Each type and color of tile must be provided from a single source. Each type and color of mortar, adhesive, and grout must be provided from the same source.

1.5 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to tilework.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.8 EXTRA MATERIALS

Supply an extra 2 percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Provide tiles that comply with ANSI A137.1 and are standard grade tiles. Provide a minimum breaking strength of 350 lbf. for porcelain wall tile and 400 lbf. for floor tile in accordance with ASTM C648. Provide floor tiles with a wet dynamic coefficient of friction (DCOF) value of 0.42 or greater when tested in accordance with ANSI A137.1 requirements. Provide an unpolished floor tile with a Class IV-Commercial or V-Heavy Commercial classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints. Submit manufacturer's catalog data.

2.1.1 Porcelain Tile

Provide unglazed or glazed, rectified porcelain tile, and trim pieces as indicated on the drawings with color extending uniformly through the body of the tile. Provide tile with a , V2, or V3 aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile size(s) as indicated on the drawings. Provide a 0.50 percent maximum water absorption in accordance with ASTM C373.

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Provide non-aerosol adhesive 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 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 meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives. Submit two color samples of grout for approval.

2.4.1 Latex-Portland Cement Mortar

Must comply with ANSI A118.4.

2.4.2 Organic Adhesive

Type I. Water-resistant. Comply with ANSI A136.1.

2.4.3 Epoxy Resin Grout

TCNA Hdbk. Provide product with GreenGuard Certification. Product must be stainproof and uniform in color. It must meet performance requirements of ANSI A118.3.

2.4.4 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Grout sealant must not change the color or alter the appearance of the grout. Refer to Section 07 92 00 JOINT SEALANTS.

Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) meeting 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 certification or validation of indoor air quality for sealants.

2.5 TRANSITION STRIPS

Provide clear anodized aluminum transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials. Provide transition strips that comply with 36 CFR 1191 requirements.

2.6 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture in accordance with as indicated on drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide floor patterns as specified on the drawings.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of ANSI A108.02 standards for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

Do not install building construction materials that show visual evidence of biological growth.

3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCNA Hdbk W244-19 in areas with cementitous backer units, W248-19 in areas with glass mat water-resistant gypsum tile backing board. Grout joints must be installed as recommended by the manufacturer for the type of tile and as indicated on drawings. Install thinner wall tile flush with thicker wall tile applied on same wall and provide installation materials as recommended by the tile and setting materials manufacturer's to achieve flush installation. Align

grout joints of wall and floor tile if possible. Provide crack isolation membrane at all first floor locations that specify a latex portland cement mortar - ANSI A118.4 or better or ISO C2S1 or better. Provide a water proof membrane at all above ground applications - ANSI A118.10. Conform to TCNA Hdbk TR711-19 for tiling over other surfacing/materials in renovation conditions. Tile walls in accordance with ANSI A108.4.

3.3.1 Dry-Set Mortar and Latex-Portland Cement Mortar

Use Latex-Portland Cement to install tile in accordance with TCNA Hdbk. Use Latex Portland Cement when installing porcelain ceramic tile.

3.3.2 Organic Adhesive

Conform to TCNA Hdbk W242-19 for the organic adhesive installation of ceramic tile.

3.3.3 Epoxy Tile Grout

Prepare and install epoxy tile grout in accordance with TCNA Hdbk. Provide and apply manufacturer's standard product for sealing grout joints in accordance with manufacturer's recommendations.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with TCNA Hdbk F114-19 method and with grout joints as recommended by the manufacturer for the type of tile or as indicated on drawings. Provide crack isolation membrane at all first floor locations that specify a latex portland cement mortar - ANSI A118.4 or better or ISO C2S1 or better. Provide a water proof membrane at all above ground applications - ANSI A118.10.Conform to TCNA Hdbk TR711-19 for tiling over other surfacing/materials in renovation conditions. Tile flooring in accordance with ANSI A108.4.

3.4.1 Latex-Portland Cement

Use Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.5. Use Latex Portland cement when installing porcelain ceramic tile.

3.4.2 Epoxy Tile Grout

Prepare and install epoxy tile grout in accordance with ANSI A108.10. Provide and apply manufacturer's standard product for sealing grout joints in accordance with manufacturer's recommendations.

3.5 INSTALLATION OF TRANSITION STRIPS

Install transition strips where indicated, in a manner similar to that of the ceramic tile floor and as recommended by the manufacturer. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.6 EXPANSION JOINTS

Reference and follow TCNA EJ171-19. Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.6.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.6.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs.

3.7 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that must be continuously used as passageways by workmen. Replace damaged or defective tiles. Submit copy of manufacturer's printed maintenance instructions.

-- End of Section --

SECTION 09 51 00

ACOUSTICAL CEILINGS
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 A489	(2018; E 2018) Standard Specification for Carbon Steel Eyebolts
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1008/A1008M	(2024) 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 B633	(2023) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C423	(2023; E 2024) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2022) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C834	(2017; R 2023) Standard Specification for Latex Sealants
ASTM E413	(2022) Classification for Rating Sound Insulation
ASTM E795	(2023) Standard Practices for Mounting Test Specimens During Sound Absorption Tests

ASTM E1111/E1111M	(2014; R 2022) Standard Test Method for Measuring the Interzone Attenuation of Open Office Components
ASTM E1264	(2023) Standard Classification for Acoustical Ceiling Products
ASTM E1414/E1414M	(2021a) Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E1477	(1998; R 2022a) Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) 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

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings

SD-03 Product Data

Recycled Content for Type IX Ceiling Tiles

Recycled Content for Suspension Systems

Acoustical Performance

SD-04 Samples

Acoustical Units

SD-06 Test Reports

SD-07 Certificates

Indoor Air Quality for Type IX Ceiling Tiles

Indoor Air Quality for Humidity Resistant Ceiling Tiles

Indoor Air Quality for Adhesives

Indoor Air Quality for Sealants

1.3 DELIVERY, STORAGE. AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.4 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.5 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship including but not limited to, sagging and warping of panels and rusting and of grid systems, for a period of ten years from date of final acceptance of the work.

1.7 EXTRA MATERIALS

Furnish spare tiles, from the same lot as those installed, of each color at the rate of 5 tiles for each 1000 tiles installed.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. Provide the unit size, texture, finish, and color as specified. The Contractor has the option to substitute inch-pound (I-P) Recessed Light Fixtures (RLF) for metric RLF. If the Contractor opts to provide I-P RLF, then provide I-P products for other ceiling elements like acoustical ceiling tiles, air diffusers, air registers and grills. Coordinate the entire ceiling system with other details, like the location of access panels and ceiling penetrations, for instance, shown on the drawings. Submit drawings showing the the location, extent and details of acoustical treatment including suspension system, method of anchoring and fastening, and reflected ceiling plan. Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.

2.1.1 Acoustical Performance

2.1.1.1 Ceiling Sound Transmission

Provide ceiling systems with the specified Ceiling Attenuation Class (CAC) ratings as determined in accordance with ASTM E1414/E1414M and ASTM E413. Provide sound attenuators over light fixtures, air terminals and other ceiling penetrations, provide acoustical blanket insulation on top of the ceiling or adjacent to partitions to provide lightweight acoustical plenum barriers above partitions as required to achieve the specified CAC ratings. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be installed on the project.

2.1.1.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423. Determine Articulation Class (AC) in accordance with ASTM E1111/E1111M.

2.1.2 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 test method.

2.2 ACOUSTICAL UNITS

Submit samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform acoustical units to ASTM E1264, Class A, and the following requirements:

2.2.1 Units for Exposed-Grid System

2.2.1.1 Type

IX (mineral fiber with scrubbable finish). Provide Type IX Acoustical Ceiling Tiles containing a minimum 50 percent recycled content. Provide data identifying percentage of recycled content for Type IX ceiling tiles. Provide certification of indoor air quality for Type IX Ceiling Tiles.

2.2.1.2 Flame Spread

Class A, 25 or less

2.2.1.3 Pattern

E

2.2.1.4 Minimum NRC

0.55 when tested on mounting Type E-400 of ASTM E795.

2.2.1.5 Minimum Light Reflectance Coefficient

0.85

2.2.1.6 Nominal Size

24 by 24 inch

2.2.1.7 Edge Detail

Tegular

2.2.1.8 Finish

Factory-applied standard finish. See paragraph COLORS AND STANDARDS.

2.2.1.9 Minimum CAC

35

2.2.2 Humidity Resistant Composition Units

2.2.2.1 Type

Non-asbestos mineral or glass fibers bonded with ceramic, moisture resistant thermo-setting resin, or other moisture resistant material and having a factory applied white paint finish. Provide panels that do not sag or warp under conditions of heat, high humidity or chemical fumes.

Provide certification of indoor air quality for Humidity Resistant Ceiling Tiles.

2.2.2.2 Flame Spread

Class: A, 25 or less

2.2.2.3 Pattern

E

2.2.2.4 Minimum NRC

0.55 when tested on Mounting Type E-400 of ASTM E795.

2.2.2.5 Minimum Light Reflectance Coefficient

LR-1, 0.85 or greater

2.2.2.6 Nominal Size

24 by 24 inch

2.2.2.7 Edge Detail

Tegular

2.2.2.8 Finish

Factory-applied standard finish. See paragraph COLORS AND PATTERNS.

2.2.3 Unit Acoustical Absorbers

Provide individually mounted sound absorbing plaques composed of glass

fibers or non-asbestos mineral fibers and having a NRC range of not less than 0.60 - 0.70 when tested in accordance with ASTM C423 and reported as a 4 frequency average.

2.3 SUSPENSION SYSTEM

Provide standard exposed-grid as shown on drawings, conforming to ASTM C635/C635M for intermediate-duty systems. Provide surfaces exposed to view of aluminum with a clear anodized finish. Provide wall molding having a flange of not less than 9/16 inch. Provide inside and outside corner caps standard mitered corners. Provide a suspension system with a maximum deflection of 1/360 of the span length capable of supporting the finished ceiling, light fixtures, air diffusers, and accessories, as shown.

Provide Suspension System containing a minimum of 15 percent recycled content. Provide data identifying percentage of recycled content for suspension systems.

2.4 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.4.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge).

2.4.2 Straps

Provide straps of 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.4.3 Rods

Provide 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

2.4.4 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Provide minimum 1/4 inch, zinc coated eyebolts.

2.4.5 Masonry Anchorage Devices

Comply with ASTM C636/C636M for anchorage devices for eyebolts.

2.5 ADHESIVE

Use adhesive as recommended by tile 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 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. For products located on

the interior of the building (inside of the weatherproofing system), provide certification or validation of indoor air quality for adhesives.

2.6 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

2.7 COLORS AND PATTERNS

Use colors and patterns for acoustical units and suspension system components as indicated; colors listed are not intended to limit the selection of equal colors from other manufacturers.

2.8 ACOUSTICAL SEALANT

Conform acoustical sealant to ASTM C834, nonstaining. Provide sealants used on the interior of the building (defined as inside of the weatherproofing system)in accordance with requirements of Section 07 92 00 JOINT SEALANTS that meet either emissions requirements of CDPH SECTION 01350 (limit the requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for Sealants.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 6 inch from each corner of each fixture.

3.1.1.2 Splayed Hangers

Splay (slope or slant) hangers around obstructions, offsetting the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than 3 inch from ends of each length and not more than 16 inch on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

3.1.4 Acoustical Sealant

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.1.5 Adhesive Application

Wipe back of tile to remove accumulated dust. Daub acoustical units on back side with four equal daubs of adhesive. Apply daubs near corners of tiles. Ensure that contact area of each daub is at least 2 inch diameter in final position. Press units into place, aligning joints and abutting units tight and uniform without differences in joint widths.

3.2 CEILING ACCESS PANELS

Locate ceiling access panels directly under the items which require access.

3.3 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

3.4 RECLAMATION PROCEDURES

Neatly stack completely dry ceiling tile, designated for recycling by the Contracting Officer, on 4 by 4 foot pallets not higher than 4 foot.

Shrink wrap and symmetrically stack pallets on top of each other without falling over.

-- End of Section --

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SECTION 09 67 23.13

STANDARD RESINOUS FLOORING
27SEP2018

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 D4259	(2018) Standard Practice for Abrading Concrete

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Product Data

Within 30 days of contract award, submit manufacturer's catalog data

1.2.2 Design Mix Data

Within 30 days of contract award, submit design mix data including a complete list of ingredients and admixtures:

Ensure applicable test reports verify the mix has been successfully tested and meets design requirements.

1.3 SUBMITTALS

Government approval is required for all submittals.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Catalog Data

SD-04 Samples

Hardboard Mounted Epoxy Flooring

SD-05 Design Data

Design Mix Data

SD-07 Certificates

Listing of Product Installations

Referenced Standards Certificates

SD-11 Closeout Submittals

Warranty

1.4 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction. Deliver materials in original packages, containers, or bundles bearing brand name and name of material.

Maintain materials used in the installation of floor topping at a temperature between 65 and 85 degrees F.

1.5 QUALITY CONTROL

Prior to commencement of work, submit referenced standards certificates for the following, showing conformance with the referenced standards contained in this section

1.5.1 Qualifications

Submit a listing of product installations for resinous flooring including identification of at least 5 units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. Identify purchaser, address of installation, service organization, and date of installation.

1.5.2 Sampling

Submit hardboard mounted epoxy flooring samples not less than 6-inch square for each required color.

Provide panels showing nominal thickness of finished toppings, color, and texture of finished surfaces. Finished floor toppings and the approved samples are to match in color and texture.

1.6 WARRANTY

Submit a 2 year written warranty for all materials and installation work.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Seamless, multi-component epoxy resinous flooring system. Primer with urethane troweled mortar, High performance multi-component solvent free epoxy undercoat, double broadcast, quartz aggregate broadcast media. High performance multi component urethane sealers. Overall system thickness, 1/8".

2.2 MATERIALS

2.2.1 Top Coat

a. two, three or four-component aliphatic urethane protective coating.
b. Satin Finish.
c. High-wear resistant grit.

2.2.2 Grout Coat

a. Clear glaze.
b. 1 coat for standard texture, 2 coats for orange peel texture,

3 coats for smooth texture.
c. Number of Coats: One.

2.2.3 Quartz Broadcast
a. Clear glaze.
b. Broadcast with decorative quarts aggregate.
c. Number of Coats: One.

2.2.4 Second Quartz Broadcast
a. Clear glaze.
b. Broadcast with decorative quarts aggregate.
c. Number of Coats: One.

2.2.5 Primer

a. two-component, water borne, low VOC epoxy primer.

2.3 Physical Properties

Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

1. Tensile Strength: 4,000 psi per ASTM D-638
2. Flexural Strength: 6,250 psi per ASTM D-790
3. VOC Content: 0 g/l
4. Water Absorption: 0.04% per ASTM D-570
5. Static Coefficient of friction: >.60 per ANSI B101.1
6. Bond strength: >300 psi 100% concrete failure per ASTM D-7234
7. Hardness: 80 per ASTM D-2240
8. Compressive strength to Concrete: 400 psi per ASTM D-4541
9. Linear Coefficient of Thermal Expansion: 2 x 10^-5 in./in. per ASTM C-531
10. Impact Resistance: Exceeds 160 in.-lbs. per ASTM D-4226
11. Abrasion resistance: 0.03 gm max. weight loss per ASTM D-4060 CS-17
12. Critical Radiant Flux: Class I per ASTM E-648

PART 3 EXECUTION

3.1 PREPARATION

Prior to applying resinous flooring material, inspect substrate and immediately report any unsatisfactory conditions that exist and repair.

3.1.1 Safety Precautions

Prior to application in confined spaces of toppings and coatings containing flammable or toxic properties, institute safety precautions and provide forced ventilation to ensure that vapor concentration is kept at acceptable limits as recommended by the manufacturer of the product.

Erect "NO SMOKING" signs, and prohibit smoking or use of spark- or flame-producing devices within 50 feet of any mixing or placing operation involving flammable materials.

Provide personnel required to handle, mix, or apply toppings containing toxic or flammable properties with such items of personal protective equipment and apparel for eye, skin, and respiratory protection as are

recommended by the manufacturer of the product. Ensure all personnel are trained in the appropriate use and wearing of personal protection equipment.

Substrate must be profiled, clean, sound, and dry. Substrate must be primed.

3.1.2 Protection of Adjacent Surfaces

In addition to the protection of adjacent surfaces during installation, provide areas used to store and mix materials with a protective covering under the materials. After application of the sealer coats, protect finished flooring during the remainder of the construction period. In areas of expected minimum or moderate traffic, cover floors with 70-pound kraft paper, with strips taped together and edges secured to prevent roll-up. Place vegetable fiberboard, plywood, or other suitable material that does not mar the flooring over the paper to protect areas used as passages by workmen and areas subject to floor damage because of subsequent building operations. Upon completion of construction, remove the protection, clean flooring and, where necessary, repair, reseal, or both, at no additional cost to the Government.

3.1.3 Concrete Subfloor

3.1.3.1 Existing Concrete Floors

Clean existing concrete floors, by mechanical means to remove hard troweled or contaminated areas in conformance with ASTM D4259, and ensure concrete is free of all paint, sealers, curing agents, oil, grease, moisture, dirt, laitance or any other contaminants. Remove any loose or corroded segments of existing concrete and patch with a grouting compound as recommended by the resinous flooring manufacturer. Fill all cracks with an elastomeric jointing compound compatible with the resinous flooring system used.

3.1.4 Mixing Of Materials

Use mechanical equipment for mixing of materials in accordance with the manufacturer's instructions.

3.2 APPLICATION

3.2.1 Areas of Application

Remove equipment prior to installation of material unless directed otherwise by the Contracting Officer. Cover and/or mask surfaces not to receive the epoxy floor topping, such as equipment or cabinets installed prior to surface-preparation efforts and adjacent to the flooring installation. Apply in a uniform, uninterrupted surface except at joints if indicated.

3.2.2 Application

Install all coatings and aggregate in strict accordance with manufacturer's requirements, including temperature and humidity.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written

instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
a. Apply joint sealant to comply with manufacturer's written recommendations.

Apply Primer: over prepared substrate at manufacturer's recommended spreading rate.

Trowel mortar base: Mix mortar material according to manufacturer's recommended procedures. Climatic and non-climatic resinous flooring systems may vary slightly on mode of application. Application should be based upon the following: Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended height. Metal trowel (hand or power) single mortar coat in thickness indicated for flooring system, grout to fill substrate voids. When cured, sand to remove trowel marks and roughness.

Under Coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

Broadcast: Immediately broadcast vinyl flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

Second Sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.3 FIELD QUALITY CONTROL

3.3.1 Tolerance

From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base. Broadcast resinous flooring system will contour substrate. Deviation and tolerance are subject to concrete tolerance

3.3.2 Curing, Protection and Cleaning

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

B. Close area of application for a minimum of 24 hours.

C. Protect resinous flooring materials from damage and wear during construction operation. Cover flooring with kraft type paper. In high traffic areas use 6 mm (1/4 inch) thick hardboard, plywood, or particle board.

D. Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

3.3.3 Repairing

Remove and replace damaged or unacceptable portions of completed work with new work to match adjacent surfaces at no additional cost to the Government.

3.4 ADJUSTING AND CLEANING

Clean surfaces of the new work, and adjacent surfaces soiled as a result of the work. Remove all equipment, surplus materials, and rubbish associated with the work from the site.

-- End of Section --

SECTION 09 72 00

DIGITALLY PRINTED WALL GRAPHICS
08/17, 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.

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) 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

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 286	(2024) Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS CCC-W-408	(Rev D; Notices 1, 2, 3) Wallcovering, Vinyl Coated

UNDERWRITERS LABORATORIES (UL)

UL 723	(2020) UL Standard for Safety Test for Surface Burning Characteristics of

Building Materials

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Wallcoverings and Accessories

Primer and Adhesive

SD-04 Samples

Wallcoverings and Accessories

SD-07 Certificates

Indoor Air Quality

SD-08 Manufacturer's Instructions

Wallcoverings and Accessories

SD-10 Operation and Maintenance Data

Wallcoverings and Accessories

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1.1 Fabrics and Wallcoverings

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 program that products meet the requirements of this Section. Provide current product certification documentation from certification body.

1.3.1.2 Primers and Adhesives

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

Deliver the material to the site in manufacturer's original wrappings and packages and clearly label with the manufacturer's name, brand name, pattern and color name and number, dye lot number, size, and other related information. Store in a safe, dry, clean, and well-ventilated area at temperatures not less than 50 degrees F and within a relative humidity range of 30 to 60 percent. Store wallcovering material in a flat position and protected from damage, soiling, and moisture. Do not open containers until needed for installation, unless verification inspection is required.

1.5 ENVIRONMENTAL REQUIREMENTS

Comply with wall protection manufacturer's printed installation instructions for minimum temperature of area to receive requirements for conditioning adhesive and wallcovering. Provide a minimum 50 degrees F area temperature, 72 hours prior to installation, during installation, and until the adhesive dries. Observe ventilation and safety procedures.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties.

1.7 EXTRA MATERIALS

Provide one linear foot of full-width wall protection of each pattern and color for each 100 linear feet of wallcovering installed. Provide the same manufacturer, type, pattern, color, and lot number of extra stock as the installed wall protection. Provide full rolls, packed for storage and marked with content, manufacturer's name, pattern and color name and number and dye lot number. Leave extra stock at the site at a location as directed by the Contracting Officer.

PART 2 PRODUCTS

2.1 WALLCOVERINGS AND ACCESSORIES

Provide wall protection and accessories material designed specifically for the specified use. Provide vinyl wall protection with a mercury, cadmium, lead, and chromium free base. Protect wall protection with abrasion-resistant treatments.

2.1.1 Product Data

a. Wall Protection: Submit manufacturer's descriptive data, documenting physical characteristics, flame resistance, mildew and germicidal characteristics for wallcovering.

b. Primer and Adhesive: Submit manufacturer's descriptive data, documenting physical characteristics, mildew and germicidal characteristics.

2.1.2 Samples

2.1.2.1 Wall Protection

Provide three samples of each indicated type, pattern, and color of wall protection. Provide minimum 3 yards long by the width specified, of each type to be installed in the work, as required to illustrate pattern repeat,

material weight, color, shade, decorative design, and embossing when required.

2.1.3 Certificates

Submit manufacturer's statement attesting that the product furnished meets or exceeds specification requirements. Date the statement after the award of the contract, state Contractor's name and address, name the project and location, and list the requirements being certified. Include these certificates:

(1) Certified laboratory test reports of the physical properties for vinyl wallcovering, as specified.

(2) Certificates of Compliance for UL fire hazard classification listing, as specified.

(3) Certificates of Compliance for contact adhesive.

2.1.4 Manufacturer's Instructions

Submit preprinted installation instructions for wall protection and accessories, adhesives and primers. Include substrate preparation and material application in the instructions.

2.1.5 Operations and Maintenance Data

a. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

b. Submit three copies of manufacturer's maintenance instructions for each type of vinyl wall protection and accessory describing recommended type of cleaning equipment and materials, spotting and cleaning methods, and cleaning cycles. Instructions to also include preventative maintenance, recommended cleaning materials and precautions in the use of cleaning materials that may be detrimental to the wall protection surface and accessories when improperly applied.

2.2 DIGITALLY PRINTED WALL GRAPHIC

MATERIALS

2.2.1 WALL GRAPHIC

Type II conforming to Federal Specification CCC-W-408A and WA-101-A using test methods given in Federal Specification CCC-T-191 b excepted as otherwise specified

1. Total Weight: 21 ounces per linear yard.
2. Backing Weight: 3.1 ounces per linear yard.
3. Vinyl Weight: 17.9 ounces per linear yard
4. Thickness: 0.018 to 0.026 inches
5. Fabric backing and content: Poly-Cotton Woven

2.3 VINYL WALL PROTECTION

Provide 100% vinyl coated wall protection. Conform to FS CCC-W-408 for vinyl wall protection, Type III (Heavy Duty) with a minimum total weight of 35 ounces/linear yard. Provide width of 52inch. Test vinyl wall

protection in accordance with NFPA 286 or meet the requirements of Class A when tested in accordance with ASTM E84 or UL 723. Wall protection must have a polyester backing.

Provide Vinyl Wall Protection containing solvent-free inks.

Provide certification of indoor air quality for vinyl wall protection.

2.4 PRIMER AND ADHESIVE

Provide a type primer and adhesive recommended by the wallcovering manufacturer, containing a non-mercury based mildewcide, and complying with local indoor air quality standards. Primer must permit removal of the wallcovering and protect the wall surface during removal. Do not damage gypsum wallboard facing paper during removal of wallcovering. Provide a strippable type adhesive. When substrate color variations show through vinyl wallcovering, provide a white pigmented primer as recommended by the wallcovering manufacturer used to conceal the variations. Provide a recommended type adhesive to install corner guards and wainscot cap by the manufacturer of the corner guards and wainscot cap.

Provide primers and 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 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for primer; also, provide certification or validation of indoor air quality for adhesives.

2.5 COLOR, TEXTURE, AND PATTERN

Provide color, texture and pattern in accordance with the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

Inspect all areas and conditions under which wallcoverings are to be installed. Notify the Contracting Officer, in writing, of any conditions detrimental to the proper and timely completion of the installation. Work will proceed only when conditions have been corrected and accepted by the installer.

3.2 SURFACE PREPARATION

Do not apply wallcovering to surfaces that are rough, that contain stains which will bleed through the wallcovering, or that are otherwise unsuitable for proper installation. Fill cracks and holes; sand rough spots smooth. Finish walls to receive presentation dry erase wallcovering to a Level 4 gypsum wallboard finish in accordance with GA 214 unless Level 5 is recommended by the wallcovering manufacturer. Wall surfaces should be clean, smooth, and free from any marks, mildew, and imperfections. Any loose paint, existing wallcoverings, or other surface

materials should be removed. Any mold or mildew must be removed from the hanging surfaces prior to installation. Walls should not contain in excess of 4% residual moisture content. A moisture meter should be used to determine moisture content. Moisture infiltration and accumulation can lead to mold or mildew growth and must be corrected prior to the installation of the wallcovering. If you
are unsure if moisture problems are present, consult a qualified professional before proceeding. A wallcovering primer (Roman-PRO 977 Ultra Prime is recommended) is required and it is never recommended to apply wallcovering directly to paint. Gypsum board finish should comply with AWCI Specification, Level 4 or higher although a Level 5 finish is ideal. Use only a lead pencil for marking walls and back of wallcovering. Do not use ballpoint or marking pen, they will bleed through the surface. Do not install wallcovering unless a temperature between 70° F and 100° F, with a relative humidity level of 50% or less is maintained in both areas of installation and storage for at least 72 hours prior to, during, and after installation. Make sure that all surfaces to receive wallcovering are protected from damage during installation.

3.3 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.3.1 Wall Protection

Install wall protection in accordance with the manufacturer's printed installation instructions. Remove glue and adhesive spillage from wallcovering face and seams with a remover recommended by the manufacturer.

3.3.2 Wall Graphic

Install wall graphics in accordance with the manufacturer's printed installation instructions.

3.4 CLEAN-UP

Upon completion of the work, clean wallcovering free of dirt, soiling, stain, or residual film. Remove and clean surplus materials, rubbish, and debris resulting from the wallcovering installation.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS
02/21

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

1.1.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.

b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.

c. Existing coated surfaces that are damaged during performance of the work.

1.1.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, and existing uncoated surfaces, of buildings and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.1.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, and existing coated surfaces of buildings and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

a. Exposed columns, girders, beams, joists, and metal deck; and

b. Other contiguous surfaces.

1.1.2 Painting Excluded

Do not paint the following unless indicated otherwise.

a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.

b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.

c. Steel to be embedded in concrete.

d. Copper, stainless steel, aluminum, anodized aluminum, brass, and lead except existing coated surfaces.

e. Hardware, fittings, and other factory finished items.

1.1.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new and existing surfaces.

a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.

(1) Exposed piping, conduit, and ductwork;

(2) Supports, hangers, air grilles, and registers;

(3) Miscellaneous metalwork and insulation coverings.

b. Do not paint the following, unless indicated otherwise:

(1) New zinc-coated, aluminum, and copper surfaces under insulation

(2) New aluminum jacket on piping

(3) New interior ferrous piping under insulation.

1.1.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes.

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 CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2017; Suppl 2020) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D235	(2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4444	(2013; R 2018) Standard Test Method for

	Laboratory Standardization and Calibration of Hand-Held Moisture Meters
ASTM D6386	(2016a) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM F1869	(2022) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)

Intelligence Bulletin 65	(2013) Occupational Exposure to Carbon Nanotubes and Nanofibers

MASTER PAINTERS INSTITUTE (MPI)

MPI 4	(2016) Interior/Exterior Latex Block Filler
MPI 9	(2016) Alkyd, Exterior Gloss (MPI Gloss Level 6)
MPI 11	(2016) Latex, Exterior Semi-Gloss, MPI Gloss Level 5
MPI 23	(2015) Primer, Metal, Surface Tolerant
MPI 45	(2016) Primer Sealer, Interior Alkyd
MPI 46	(2016) Undercoat, Enamel, Interior
MPI 47	(2016) Alkyd, Interior, Semi-Gloss (MPI Gloss Level 5)
MPI 50	(2015) Primer Sealer, Latex, Interior
MPI 57	(2012) Varnish, Interior, Polyurethane, Oil Modified, Satin
MPI 72	(2016) Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)
MPI 76	(2016) Primer, Alkyd, Quick Dry, for Metal
MPI 77	(2015) Epoxy, Gloss
MPI 79	(2016) Primer, Alkyd, Anti-Corrosive for Metal
MPI 90	(2012) Stain, Semi-Transparent, for Interior Wood
MPI 94	(2016) Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)
MPI 101	(2016) Primer, Epoxy, Anti-Corrosive, for Metal

MPI 107	(2016) Primer, Rust-Inhibitive, Water Based
MPI 116	(2012) Block Filler, Epoxy
MPI 119	(2016) Latex, Exterior, Gloss (MPI Gloss Level 6)
MPI 134	(2015) Primer, Galvanized, Water Based
MPI 140	(2016) Latex, Interior, High Performance Architectural, (MPI Gloss Level 4)
MPI 144	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 2)
MPI 145	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 3)
MPI 149	(2016) Primer Sealer, Interior, Institutional Low Odor/VOC
MPI 153	(2016) Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 163	(2016) Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI ASM	(2019) Architectural Painting Specification Manual
MPI GPS-1-14	(2014) Green Performance Standard GPS-1-14
MPI GPS-2-14	(2014) Green Performance Standard GPS-2-14
MPI MRM	(2015) Maintenance Repainting Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007) Brush-Off Blast Cleaning
SSPC Glossary	(2011) SSPC Protective Coatings Glossary
SSPC Guide 6	(2021) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
SSPC Guide 7	(2015) Guide to the Disposal of Lead-Contaminated Surface Preparation Debris
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 2	(2018) Hand Tool Cleaning
SSPC SP 3	(2018) Power Tool Cleaning

SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC SP 10/NACE No. 2	(2015) Near-White Blast Cleaning
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS 3	(2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313	(2018) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000	Air Contaminants
29 CFR 1910.1001	Asbestos
29 CFR 1910.1025	Lead
29 CFR 1926.62	Lead

1.3 DEFINITIONS

1.3.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third-party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.3.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

1.3.3 Coating

SSPC Glossary; (1) A liquid, liquefiable, or mastic composition that is

converted to a solid protective, decorative, or functional adherent film after application as a thin layer; (2) Generic term for paint, lacquer, enamel.

1.3.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.3.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five levels are generically defined under the Assessment sections in the MPI MRM, MPI Maintenance Repainting Manual.

1.3.6 EXT

MPI short term designation for an exterior coating system.

1.3.7 INT

MPI short term designation for an interior coating system.

1.3.8 Loose Paint

Paint or coating that can be removed with a dull putty knife.

1.3.9 mil / mils

The English measurement for 0.001 in or one one-thousandth of an inch.

1.3.10 MPI Gloss Levels

MPI system of defining gloss. Seven gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degree angle	Units at 80 degree angle
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and

Gloss (G6).

1.3.11 MPI System Number

The MPI coating system number in each MPI Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN).

1.3.12 Paint

SSPC Glossary; (1) Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer that is converted to an opaque solid film after application. Used for protection, decoration, identification, or to serve some other functional purposes; (2) Application of a coating material.

1.3.13 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.3.14 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

1.4 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs.

1.5 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-02 Shop Drawings

Piping Identification

SD-03 Product Data

Coating

Product Data Sheets

SD-04 Samples

Color

SD-07 Certificates

Indoor Air Quality for Paints and Primers

SD-08 Manufacturer's Instructions

Application Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings, Data Package 1

1.6 QUALITY ASSURANCE

1.6.1 Regulatory Requirements

1.6.1.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.6.1.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.6.1.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.6.1.4 Asbestos Content

Provide asbestos-free materials.

1.6.1.5 Mercury Content

Provide materials free of mercury or mercury compounds.

1.6.1.6 Silica

Provide abrasive blast media containing no free crystalline silica.

1.6.1.7 Human Carcinogens

Provide materials that do not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.6.1.8 Carbon Based Fibers / Tubes

Materials must not contain carbon based fibers such as carbon nanotubes or carbon nanofibers. Intelligence Bulletin 65 ranks toxicity of carbon nanotubes on a par with asbestos.

1.6.2 Coating Contractor's Qualification

Submit the name, address, telephone 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 and telephone number 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

1.6.3 Approved Products List

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of Contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire Contract and each coating system is to be from a single manufacturer. Provide all coats on a particular substrate from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

1.6.4 Paints and Coatings Indoor Air Quality Certifications

Provide paint and coating products certified to meet indoor air quality requirements by MPI GPS-1-14, MPI GPS-2-14 or provide certification by other third-party programs. Provide current product certification documentation from certification body.

Provide certification of Indoor Air Quality for Paints and Primers. Submit required indoor air quality certifications in one submittal package.

1.7 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 5 gallons. 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 40 to 95 degrees F. 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.

1.8 SAFETY AND HEALTH

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 GOVERNMENTAL 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.

1.8.1 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.

b. 29 CFR 1910.1000.

c. ACGIH 0100, threshold limit values.

d. The appropriate OSHA standard in 29 CFR 1910.1025 and 29 CFR 1926.62 for surface preparation on painted surfaces containing lead. Removal and disposal of coatings which contain lead is specified in Section 02 83 00 LEAD REMEDIATION. Additional guidance is given in SSPC Guide 6 and SSPC Guide 7. Refer to drawings for list of hazardous materials located on this project. Coordinate paint preparation activities with this specification section.

e. The appropriate OSHA standards in 29 CFR 1910.1001 for surface preparation of painted surfaces containing asbestos. Removal and disposal of coatings which contain asbestos materials is specified in Section 02 82 00 ASBESTOS REMEDIATION. Refer to drawings for list of hazardous materials located on this project. Coordinate paint preparation activities with this specification section.

Submit manufacturer's Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

1.9 ENVIRONMENTAL REQUIREMENTS

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.

1.9.1 Coatings

Do not apply coating when air or substrate conditions are:

a. Less than 5 degrees F above dew point;

b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

1.9.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

a. Supply 100 percent outside air 24 hours a day.

b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.

c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

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, pot life, and curing and drying times between coats.

2.2 COLOR SELECTION OF FINISH COATS

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 are approximately the colors indicated and the product conforms to specified requirements.

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. Tint each coat progressively darker to enable confirmation of the number of coats.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, reinstall removed items by workmen skilled in the trades. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, and other foreign

matter and substances deleterious to coating performance as specified 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. Refer to MPI ASM and MPI MRM for additional more specific substrate preparation requirements.

3.2.1 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 with a clean, dry cloth saturated with mineral spirits, ASTM D235 or as specified in MPI MRM. Wipe the surfaces dry with a clean, dry, lint free cloth. 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 the paint manufacturer and specific surface preparation requirements as outlined in MPI MRM Exterior Surface Preparation and Interior Surface Preparation.

e. Thoroughly clean previously painted surfaces of all grease, dirt, dust or other foreign matter.

f. Remove blistering, cracking, flaking and peeling or otherwise deteriorated coatings.

g. Remove chalk so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8.

h. 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.

i. Feather and sand smooth edges of chipped paint.

j. Clean rusty metal surfaces in accordance with SSPC requirements. Use solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting.

k. Provide new, proposed coatings that are compatible with existing coatings.

3.2.2 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 so that when tested in

accordance with ASTM D4214, the chalk rating is not less than 8.

3.2.3 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.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Existing and New Ferrous Surfaces

a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, or SSPC SP 3. Brush-off blast remaining surface in accordance with SSPC 7/NACE No.4. Use inhibitor as recommended by coating manufacturer to prevent premature rusting. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.

b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 6/NACE No.3.

3.3.2 Final Ferrous Surface Condition:

3.3.2.1 Tool Cleaned Surfaces

Comply with SSPC SP 2 and SSPC SP 3. Use as a visual reference, photographs in SSPC VIS 3 for the appearance of cleaned surfaces.

3.3.2.2 Abrasive Blast Cleaned Surfaces

Comply with SSPC 7/NACE No.4, SSPC SP 6/NACE No.3, and SSPC SP 10/NACE No. 2. Use as a visual reference, photographs in SSPC VIS 1 for the appearance of cleaned surfaces.

3.3.3 Galvanized Surfaces

a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. Completely remove coating by brush-off abrasive blast if the galvanized metal has been passivated or stabilized. Do not "passivate" or "stabilize" new galvanized steel to be coated. If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D6386, Appendix X2, and remove by one of the methods described therein.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete and Masonry

a. Curing: Allow concrete, stucco and masonry surfaces to cure at least

30 days before painting, and concrete slab on grade to cure at least 90 days before painting.

b. Surface Cleaning: Remove the following deleterious substances.

(1) Dirt, Chalking, Grease, and Oil: Wash new and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.

(2) Fungus and Mold: Wash new, existing coated, and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturer's recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.4.2 Gypsum Board, Plaster, and Stucco

3.4.2.1 Surface Cleaning

Verify that plaster and stucco surfaces are free from loose matter and that gypsum board is dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint is water-based.

3.4.2.2 Repair of Minor Defects

Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

3.4.2.3 Allowable Moisture Content

Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by

ASTM D4263.

3.5 PREPARATION OF WOOD SURFACES

3.5.1 New and Existing Coated Wood Surfaces, Except Floors:

a. Surface Cleaning: Clean wood surfaces of foreign matter. Verify that surfaces are free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood. Scrape to remove loose coatings. Lightly sand to roughen the entire area of previously enamel-coated wood surfaces.

b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of 3 ounces (2/3 cup) trisodium phosphate, one ounce (1/3 cup) household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

c. Do not exceed 12 percent moisture content of the wood as measured by a moisture meter in accordance with ASTM D4444, Method A, unless otherwise authorized.

d. Prime or touch up wood surfaces adjacent to surfaces to receive water-thinned paints before applying water-thinned paints.

e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.

f. Cosmetic Repair of Minor Defects:

(1) Knots and Resinous Wood: Prior to application of coating, cover knots and stains with two or more coats of 3-pound-cut shellac varnish, plasticized with 5 ounces of castor oil per gallon. Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.

(2) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.

(3) Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

g. Prime Coat For New Exterior Surfaces: Prime coat wood doors before wood becomes dirty or warped.

3.5.2 Interior Wood Surfaces, Stain Finish

Sand interior wood surfaces to receive stain. Fill oak and other open-grain wood to receive stain with a coat of wood filler not less than 8 hours before the application of stain; remove excess filler and sand the surface smooth.

3.6 APPLICATION

3.6.1 Coating Application

a. Comply with applicable federal, state and local laws enacted to ensure

compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

b. At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.

c. 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.

d. Only apply paints, except water-thinned types, to surfaces that are completely free of moisture as determined by sight or touch.

e. 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.

f. 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.

g. Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.

h. Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. Upon completion of painting, remove protective covering from sprinkler heads.

i. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel (MPI 9) applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.

j. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel (MPI 9) applied to a minimum dry film thickness of 1.0 mil or two component gloss polyurethane (MPI 72) in exterior applications.

k. Provide labeling on the surfaces of all feed and cross mains to show the pipe function such as "Sprinkler System", "Fire Department Connection", "Standpipe". For pipe sizes 4-inch and larger provide

white painted stenciled letters and arrows, a minimum of 2 in in height and visible from at least two sides when viewed from the floor. For pipe sizes less than 4-inch, provide white painted stenciled letters and arrows, a minimum of 0.75 in in height and visible from the floor.

l. All fire suppression system valves must be marked with permanent tags indicating normally open or normally closed.

m. 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.

n. 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.

o. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

p. Thermosetting Paints: Apply topcoats over thermosetting paints (epoxies and urethanes) within the overcoat window recommended by the manufacturer.

3.6.2 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.

When thinning is allowed, thin paints immediately prior to application with not more than one pint of suitable thinner per gallon. 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.

3.6.3 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.

3.6.4 Coating Systems

a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table for Exterior Applications	
MPI Division	Substrate Application
MPI Division 5	Exterior Metal, Ferrous Paint Table
MPI Division 9	Exterior EFIS Paint Table

Table for Interior Applications	
MPI Division	Substrate Application
MPI Division 4	Interior Concrete Masonry Units Paint Table
MPI Division 5	Interior Metal, Ferrous Paint Table
MPI Division 6	Interior Wood Paint Table
MPI Division 9	Interior Gypsum Board Paint Table

b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness, where specified, refers to the minimum dry film thickness.

c. Coatings for Surfaces Not Specified Otherwise: Coat unspecified surfaces 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.

3.7 COATING SYSTEMS FOR METAL

Apply coatings of Tables in MPI Division 5 for Exterior and Interior.

a. Apply specified ferrous metal primer to steel surfaces on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.

b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.

c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.

d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.

e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. Overcoat these items with the specified ferrous-metal primer prior to application of finish coats.

f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.8 COATING SYSTEMS FOR CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in MPI Division 4 for Exterior and Interior.

3.9 COATING SYSTEMS FOR WOOD

a. Apply coatings of Tables in MPI Division 6 for Exterior and Interior.

b. Prior to erection, apply two coats of specified primer to treat and prime wood surfaces which will be inaccessible after erection.

c. Apply stains in accordance with manufacturer's printed instructions.

3.10 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.11 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.12 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. When such a service is not available, contact local recyclers to reclaim the materials. Where local options exist for leftover paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility for reuse by local organizations.

3.13 PAINT TABLES

All DFT's are minimum values.

3.13.1 Exterior Paint Tables

3.13.1.1 MPI Division 5: Exterior Ferrous and Non-Ferrous Paint Table

A. Steel / Ferrous Surfaces

(1) New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

Alkyd					
New	Existing, uncoated	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1Q-G5 (Semigloss	MPI REX 5.1D-G5 (Semigloss)	MPI 23	MPI 94	MPI 94	5.25 mils
Topcoat: Coating to match adjacent surfaces.					

(2) Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3

(a) Surface previously coated with alkyd or latex

Waterborne Light Industrial Coating

Existing, previously coated with alkyd or latex	Primer	Intermediate	Topcoat	System DFT
MPI REX 5.1C-G5 (Semigloss)	MPI 79	MPI 163	MPI 163	5 mils
Topcoat: Coating to match adjacent surfaces.				

B. Exterior Galvanized Surfaces

(1) New Galvanized surfaces

Waterborne Primer / Latex				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
EXT 5.3H-G5 (Semigloss)	MPI 134	MPI 11	MPI 11	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

(2) Galvanized surfaces with slight coating deterioration; little or no rusting

Waterborne Light Industrial Coating				
Galvanized Surfaces with slight coating deterioration	Primer	Intermediate	Topcoat	System DFT

MPI REX 5.3J-G5 (Semigloss)	MPI 134	N/A	MPI 163	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

C. Exterior Surfaces, Other Metals (Non-Ferrous)

(1) Surfaces adjacent to painted surfaces; Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1D-G5 (Semigloss)	MPI 79	MPI 94	MPI 94	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

3.13.1.2 MPI Division 9: Exterior EFIS Paint Table

A. New and Existing EFIS

Latex					
New	Existing	Primer	Intermediate	Topcoat	System DFT

MPI EXT 9.1A-G5 (Semigloss)	MPI REX 9.1A-G5 (Semigloss)	MPI 11	MPI 11	MPI 11	4.5 mils
MPI EXT 9.1A-G6 (Gloss)	MPI REX 9.1A-G6 (Gloss)	MPI 119	MPI 119	MPI 119	4.5 mils
Primer as recommended by manufacturer. Topcoat: Coating and finish to match adjacent surfaces. On existing EFIS, apply primer based on surface condition.					

3.13.2 Interior Paint Tables

3.13.2.1 MPI Division 3: Interior Concrete Paint Table

A. Liquid membrane concrete curing and sealing compound is a low VOC, sprayable, water based acrylic polymer resin formulated for curing, hardening, dustproofing and sealing freshly placed concrete. Material complies with ASTM C 309, Type I, Class A. Confirm that an acceptable bonding substrate is provided for adhesives, floor coatings and elastomeric sealants installed in conjunction with scheduled floor finishes. 3.13.2.2 MPI Division 4: Interior Concrete Masonry Units Paint Table

A. New and uncoated Existing Concrete Masonry

High Performance Architectural Latex					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2D-G4 (Satin)	MPI 4	N/A	MPI 140	MPI 140	11 mils
Fill all holes in masonry surface					

B. Existing, Previously Painted Concrete Masonry

High Performance Architectural Latex					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT

MPI RIN 4.2K-G3 (Eggshell)					
MPI RIN 4.2K-G4	N/A	MPI 140	MPI 140	MPI 140	4.5 mils

C. New Concrete masonry units in toilets, restrooms, shower areas, and other high humidity areas

Epoxy					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2G-G6 (Gloss)	MPI 116	N/A	MPI 77	MPI 77	10 mils
Fill all holes in masonry surface					

D. Existing, previously painted, concrete masonry units in toilets, restrooms, shower areas, and other high humidity areas

Epoxy					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2D-G6 (Gloss)	N/A	MPI 77	MPI 77	MPI 77	5 mils

3.13.2.3 MPI Division 5: Interior Ferrous and Non-Ferrous Paint Table

A. Interior Steel / Ferrous Surfaces

(1) Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd

New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1E-G5 (Semigloss)	MPI 76	MPI 47	MPI 47	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

B. Interior overhead steel structural members and galvanized metal decking coatings are modified alkyd paint with 36% to 49% solids by volume, 3.30 to 3.34 pounds VOC per gallon and flat finish. Coatings settle as a dry powder in approximately ten feet depending on temperature, humidity and air movement. Do not thin. Clean with xylene. Furnish compatible primers.

3.13.2.4 MPI Division 6: Interior Wood Paint Table

A. Interior New and Existing, previously finished or stained Wood Doors; Natural Finish or Stained

Natural finish, oil-modified polyurethane					
New	Existing, previously finished or stained	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3K-G4	MPI RIN 6.3K-G4	MPI 57	MPI 57	MPI 57	4 mils
\	\	\	\	\	
Note: Sand between all coats per manufacturers recommendations.					

Stained, oil-modified polyurethane						
New	Existing, previously finished or stained	Stain	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3E-G4	MPI RIN 6.3E-G4	MPI 90	MPI 57	MPI 57	MPI 57	4 mils
\	\	\	\	\	\	\

Note: Sand between all coats per manufacturers recommendations.

B. New Wood Doors; Pigmented finish

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 6.3B-G5 (Semigloss)	MPI 45	MPI 47	MPI 47	4.5 mils
Note: Sand between all coats per manufacturers recommendations.				

C. Existing, previously painted Wood Doors; Pigmented finish

Alkyd				
Existing, previously finished	Primer	Intermediate	Topcoat	System DFT
MPI RIN 6.3B-G5 (Semigloss)	MPI 46	MPI 47	MPI 47	4.5 mils
Note: Sand between all coats per manufacturers recommendations.				

3.13.2.5 MPI Division 9: InteriorGypsum Board\ Paint Table

A. Interior New and Existing, previously painted Wallboard not otherwise specified

Institutional Low Odor / Low VOC Latex, New

Institutional Low Odor / Low VOC Latex				
New	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2M-G2 (Flat)	MPI 149	MPI 144	MPI 144	4 mils
MPI INT 9.2M-G3 (Eggshell)	MPI 149	MPI 145	MPI 145	4 mils

Topcoat: Coating to match adjacent surfaces. Use flat sheens, Ceiling White color, for ceilings. Use eggshell sheens for walls.				

B. Interior New and Existing, previously painted Wallboard in toilets, restrooms, shower areas, and other high humidity areas not otherwise specified

Waterborne Light Industrial Coating					
New, uncoated Existing	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2L-G5(Semigloss)	MPI RIN 9.2L-G5 (Semigloss)	MPI 50	MPI 153	MPI 153	4 mils
Topcoat: Coating to match adjacent surfaces.					

-- End of Section --

SECTION 10 11 00

VISUAL DISPLAY UNITS
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 Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 DEFINITIONS

The term visual display unit when used herein includes presentation boards, markerboards, tackboards, board cases, display track systems, horizontal sliding units, copyboards, interactive whiteboards, and projection screens; submit manufacturer's descriptive data and catalog cuts plus manufacturer's installation instructions, and cleaning and maintenance instructions. Provide visual display units from manufacturer's standard product line. Submit certificate of compliance signed by Contractor attesting that visual display units conform to the requirements specified.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Placement Schedule

SD-03 Product Data

Visual Display Unit

SD-04 Samples

Aluminum

Glass;

SD-07 Certificates

Certificate of Compliance

SD-08 Manufacturer's Instructions

Manufacturer's Cleaning Instructions

Manufacturer's Printed Installation Instructions

SD-10 Operation and Maintenance Data

Visual Display Units, Data Package 1

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality

1.4.1.1 Indoor Air Quality for Visual Display Products

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 program 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.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in the manufacturer's original unopened containers and store them in a clean dry area with temperature maintained above 50 degrees F. Stack materials according to manufacturer's recommendations. Allow visual display units to acclimate to the building temperature for 24 hours prior to installation.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MATERIALS

For each type, submit a section of core material and backing showing the lamination of porcelain enamel coating on steel, natural cork, woven fabric, non-woven fabric, or vinyl wall covering, as applicable. Submit a sample of hardwood, plastic laminate finish, or glass type, as applicable. Provide minimum 4 by 4 inch samples, or larger, showing range of color.

Submit manufacturers' descriptive product data for each type of visual display unit indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

2.1.1 Aluminum

Provide a minimum 0.06 inch thick, 6063-T5 or 6063-T6 aluminum alloy frame extrusion conforming to ASTM B221. Exposed aluminum must have anodized, satin finish. Use straight, single lengths wherever possible and keep joints to a minimum. Provide mitered corners with a hairline closure. Submit sections of frame and marker rail.

2.1.2 Glass

Provide tempered glass in accordance with ANSI Z97.1 and ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class I (clear), thickness as specified.

2.1.2.1 Glass with Interlayer Color Coating

Provide glass markerboard writing surface composed of tempered, low-iron, extra clear, safety writing glass with polished edges. Provide glass with an interlayer color coating with a durable paint/glass bond that is fade resistant, water resistant, and heat resistant.

2.1.2.2 Magnetic Glass

Provide magnetic glass markerboard writing surface composed of tempered, low-iron, extra clear, safety writing glass with polished edges and steel backing permanently adhered to the back of the glass.

2.2 MARKERBOARD

2.2.1 Glass Markerboards with Interlayer Color Coating

Provide markerboard with a smooth finish, magnetic glass writing surface units to be comprised of one piece, without joints whenever possible. When markerboard dimensions require delivery in separate sections, components must be prefit at the factory, disassembled for delivery and jointed at the site. Markerboard must include a marker rail. The markerboard does not include a map rail. Dry erase markings must be

removable with a felt eraser or dry erase cloth without ghosting. Supply each unit with an eraser and four different color compatible dry erase markers. Provide magnetic glass markerboard with 10 rare earth magnets. Provide markerboards that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification of indoor air quality for markerboards. Provide high resolution, reverse surface applied graphics where required.

2.3 COLOR

Provide finish colors for required items as indicated; colors listed are not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 PLACEMENT SCHEDULE

Location, size and mounting height of visual display units as shown on the drawings.
Mounting height is defined as distance from finished floor to top of the visual display unit frame.

3.2 INSTALLATION

Do not install items that show visual evidence of biological growth. Perform installation and assembly in accordance with manufacturer's printed installation instructions. Use concealed fasteners. Attach visual display units to the walls with suitable devices to anchor each unit. Furnish and install trim items, accessories and miscellaneous items in total, including but not limited to hardware, grounds, clips, backing materials, adhesives, brackets, and anchorages incidental to or necessary for a sound, secure, complete and finished installation. Do not initiate installation until completion of room painting and finishing operations. Install visual display units in locations and at mounting heights indicated. Install visual display units level and plumb, and if applicable align doors and adjust hardware. Repair or replace damaged units as directed by the Contracting Officer.

3.3 CLEANING

Clean writing surfaces in accordance with manufacturer's cleaning instructions.

-- End of Section --

SECTION 10 14 00.10

EXTERIOR SIGNAGE
08/17, CHG 1: 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.

AMERICAN WELDING SOCIETY (AWS)

AWS C1.1M/C1.1	(2019) Recommended Practices for Resistance Welding
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1011/A1011M	(2023) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM B26/B26M	(2018; E 2018) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B62	(2017) Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B108/B108M	(2019) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum

	and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

1.2 GENERAL REQUIREMENTS

All exterior signage must be provided by a single manufacturer. Exterior signage must be of the design, detail, sizes, types, and message content shown on the drawings, must conform to the requirements specified, and must be provided at the locations indicated. Submit exterior signage schedule in electronic media with spread sheet format. Spread sheet must include sign location, sign type, and message. Signs must be complete with lettering, framing as detailed, and related components for a complete installation. Each sample must consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Submit three color samples for each material requiring color and 12 inch square sample of sign face color sample.

1.2.1 Wind Load Requirements

Exterior signage must be designed to withstand windloads. Submit design analysis and supporting calculations performed in support of specified signage.

Marine Corps Air Station Cherry Point must resist a 139 mile per hour, ultimate design wind speed, 50 PSF, Risk Category II, Surface Roughness Category C, Exposure Category C lateral load. Comply with UFC 3-301-01 and ASCE 7 as applicable for building system designs and components.

1.2.2 Character Proportions and Heights

Letters and numbers on indicated signs for handicapped-accessible buildings must have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs must be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings

SD-03 Product Data

Installation

Exterior Signage

Wind Load Requirements

SD-04 Samples

Exterior Signage

SD-10 Operation and Maintenance Data

Protection and Cleaning

1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters must be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment must essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.5 DELIVERY AND STORAGE

Materials must be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period must be provided.

PART 2 PRODUCTS

2.1 Marine Corps Air Station Cherry Point

Conform to the signage palette described in the Base Exterior Architectural Plan. Submit signage to the Architectural Review Board prior to making submittal. Sign types are as follows:

1. Building plaque

2.1.1 Building Plaque

Plaques are 0.125 inch painted aluminum plates. Copy is die cut, engineering grade, reflective vinyl. Stud mount plaques with 0.375 inch spaceers. Locate in wall mortar joints when applicable. Signs are two piece, with a rounded header piece similar to directional and building monument signs.

One piece signs are rectangular.

2.2 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products must conform to ASTM B209 for sheet or plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Aluminum extrusions must be provided at least 1/8 inch thick

and aluminum plate or sheet at least 16 gauge thick. Welding for aluminum products must conform to AWS C1.1M/C1.1.

2.3 ORGANIC COATING

Clean, prime and give surfaces a semi-gloss baked enamel or two-component acrylic polyurethane finish in accordance with NAAMM AMP 500, AMP 505, with total dry film thickness not less than 1.2 mils.

2.4 STEEL PRODUCTS

Structural steel products must conform to ASTM A36/A36M. Sheet and strip steel products must conform to ASTM A1011/A1011M. Welding for steel products must conform to AWS D1.2/D1.2M.

2.5 CAST BRONZE

Fabricate components with sharp corners, flat faces, and accurate profiles. Remove and polish burrs and rough spots. Finish faces to a uniform high luster. Cast bronze must be in accordance with ASTM B62.

2.6 VINYL SHEETING FOR GRAPHICS

Vinyl sheeting must be 5 to 7 year premium type and must be in accordance with the flammability requirements of ASTM E84 and must be a minimum 0.003 inch film thickness. Film must include a precoated pressure sensitive adhesive backing, Class 1, or positionable pressure sensitive adhesive backing, Class 3.

2.7 ANCHORS AND FASTENERS

Exposed anchor and fastener materials must be compatible with metal to which applied and must match in color and finish and must be non-rusting, non-corroding, and non-staining. Exposed fasteners must be tamper-proof.

2.8 SHOP FABRICATION AND MANUFACTURE

2.8.1 Factory Workmanship

Work must be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled must be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws must be drilled or punched. Drilling and punching must produce clean, true lines and surfaces. Welding to or on structural steel must be in accordance with AWS D1.1/D1.1M. Welding must be continuous along the entire area of contact. Exposed welds must be ground smooth. Exposed surfaces of work must have a smooth finish and exposed riveting must be flush. Fastenings must be concealed where practical. Items specified to be galvanized must be by hot-dip process after fabrication if practical. Galvanization must be in accordance with ASTM A123/A123M and ASTM A653/A653M, as applicable. Other metallic coatings of steel sheet must be in accordance with ASTM A924/A924M. Joints exposed to the weather must be formed to exclude water. Drainage and weep holes must be included as required to prevent condensation buildup.

2.8.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or

absorptive materials subject to wetting, the surfaces must be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

2.8.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, must be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete must not be painted. Upon completion of work, damaged surfaces must be recoated.

2.9 COLOR, FINISH, AND CONTRAST

For buildings required to be handicapped-accessible, the characters and background of signs must be eggshell, matte, or other non-glare finish. Characters and symbols must contrast with their background - either light characters on a dark background or dark characters on a light background.

PART 3 EXECUTION

3.1 INSTALLATION

Signs, plaques, or dimensional letters must be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings; submit drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message must be included. Signs must be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces must not be installed until finishes on such surfaces have been completed. Submit manufacturer's installation instructions and cleaning instructions.

3.1.1 Anchorage

Anchorage and fastener materials must be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated must include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

3.1.2 Protection and Cleaning

The work must be protected against damage during construction. Hardware and electrical equipment must be adjusted for proper operation. Frames and other sign surfaces must be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, cover all project identification, directional, and other signs which may mislead the public. Covering must be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Submit six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions must include simplified diagrams for the equipment as installed. Signs must be cleaned, as required, at time of cover removal.

3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames must be field painted in accordance with Section 09 90 00 PAINTS AND COATINGS. Finish must be free of scratches or other blemishes.

-- End of Section --

SECTION 10 14 00.20

INTERIOR SIGNAGE
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 in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes
AA PK-1	(2015) Pink Sheets: Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings & Ingot

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2604	(2017a) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2024) Life Safety Code

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

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Installation

Warranty

SD-04 Samples

Interior Signage

Software

SD-10 Operation and Maintenance Data

Approved Manufacturer's Instructions

Protection and Cleaning

1.3 EXTRA MATERIALS

Provide 6 extra removable end caps for sign type S1 and one copy of the software for user produced signs and inserts after project completion and equipment necessary for removal of signage parts and pieces.

1.4 QUALITY ASSURANCE

1.4.1 Samples

Submit interior signage samples of each of the following sign types showing typical quality, workmanship and color: Directional sign, Standard Room sign, Changeable message strip sign. The samples may be installed in the work, provided each sample is identified and location recorded.

1.4.2 Detail Drawings

Submit detail drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials must be packaged to prevent damage and deterioration during shipment, handling, storage and installation. Product must be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Warrant the interior signage for a period of 2 years against defective workmanship and material. Warranties must be signed by the authorized representative of the manufacturer. Submit warranty accompanied by the document authenticating the signer as an authorized representative of the guarantor. Guarantee that the signage products and the installation are free from any defects in material and workmanship from the date of delivery.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Signs, plaques, directories, and dimensional letters must be the standard product of a manufacturer regularly engaged in the manufacture of such products that essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening. Obtain signage from a single manufacturer with edges and corners of finished letterforms and graphics true and clean.

2.2 ROOM IDENTIFICATION/DIRECTIONAL SIGNAGE SYSTEM

2.2.1 Standard Room Signs

Signs must incorporate an ABS plastic face with applied graphics including all tactile requirements in adherence to ABA and ADA requirements. All signs must have matching appearance and construction utilizing the same manufacturing process to assure consistent look and quality and must conform to the following:

a. Signage must utilize an acrylic sphere for Grade II Braille inserted directly into a scratch resistant, high pressure laminate sign face. Braille dots are to be pressure fit in high tolerance drilled holes. Braille dots must be half hemispherical domes, protruding a minimum of 0.025".

b. End caps must be aluminum style corners.

c. Tactile Lettering must be precision machined, raised 1/32", matte PETG and subsurface colored for scratch resistance.

2.2.2 Changeable Message Strip Signs

Changeable message strip signs must be of same construction as standard room signs to include a clear sleeve that will accept a paper or plastic insert identifying changeable text. The insert must be prepared typeset message mounted on paper card stock. Provide paper and software for creating text and symbols for computers identified by owner for Owner production of paper inserts after project completion. Clear sleeve must be removable without any special tools.

2.2.3 Type of Mounting For Signs

Signage must utilize a pressure activated adhesive. The adhesive must be nonhazardous and must allow for flexing and deflection of the adhered components due to changes in temperature and moisture without bond failure. All signs must be provided with appropriate mounting hardware for the wall substrate. Hardware smust be finished and architectural in

appearance. Some signs may be mounted on glass. A blank backer is required.

2.2.4 Graphics

Signage graphics for modular signs must conform to the following:

2.2.4.1 Subsurface Copy

Copy is transferred to the back face of clear acrylic sheeting forming the panel face to produce precisely formed opaque image. This method bonds all sign elements (color, graphics, lettering, Braille and substrate) into a single unit.

2.2.4.2 First Surface Copy Direct Print or Silkscreened (Non-Tactile)

Message may be applied to panel using the silkscreen process. Silkscreened images must be executed with photo screens prepared from original art. Handcut screens will not be accepted. Original art is defined as artwork that is a first generation reproduction of the specified art. Edges and corners must be clean.

2.2.4.3 Surface Applied Photopolymer

Integral graphics and Braille achieved by photomechanical stratification processes. Photopolymer used for ADA compliant graphics must be of the type that has a minimum durometer reading of 90. Tactile graphics must be raised 1/32 inch from the first surface of plaque by photomechanical stratification process.

2.2.5 Character Proportions and Heights

Letters and numbers on signs conform to 36 CFR 1191.

2.2.6 Tactile Letters, Symbols and Braille

Raised letters and numbers on signs must conform to 36 CFR 1191.

2.3 STAIR SIGNAGE

Provide signs on stairs serving three or more stories with special signage within the enclosure at each floor landing conforming to NFPA 101. Indicate the floor level, the terminus of the top and bottom of the stair enclosure, and the identification of the stair enclosure. Also, state the floor level of, and the direction to, exit discharge. Locate the signage inside the enclosure in a position that is visible when the door is in the open or closed position and install in conformance with 36 CFR 1191. The floor level designation must also be tactile in accordance with ICC A117.1 COMM.

2.4 BUILDING DIRECTORIES

Building directories must be lobby directories or floor directories, and must be provided with a changeable directory listing consisting of the areas, offices and personnel located within the facility. Dimensions, details, and materials of sign and message content must be as shown on the drawings.

2.5 ALUMINUM ALLOY PRODUCTS

Aluminum extrusions must be at least 1/8 inch thick, and aluminum plate or sheet must be at least 0.0508 inch thick. Extrusions must conform to ASTM B221; plate and sheet must conform to ASTM B209. Where anodic coatings are specified, alloy must conform to AA PK-1 alloy designation 514.0. Exposed anodized aluminum finishes must be as shown. Welding for aluminum products must conform to AWS D1.2/D1.2M.

2.6 ANODIC COATING

Anodized finish must conform to AA DAF45 as follows:

a. Clear (natural) designation AA-M10-C22-A31, Architectural Class II 0.4 mil or thicker.

2.7 ORGANIC COATING

Organic coating must conform to AAMA 2604, with total dry film thickness not less than 1.2 mils.

2.8 FABRICATION AND MANUFACTURE

2.8.1 Factory Workmanship

Holes for bolts and screws must be drilled or punched. Drilling and punching must produce clean, true lines and surfaces. Exposed surfaces of work must have a smooth finish and exposed riveting must be flush. Fastenings must be concealed where practicable.

2.8.2 Dissimilar Materials

Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

2.9 COLOR, FINISH, AND CONTRAST

Color must be as indicated on the drawings. Finish of all signs must be eggshell, matte, or other non-glare finish as required in handicapped-accessible buildings.

2.10 TYPEFACE

ADA-ABA compliant font for Room Signs.

PART 3 EXECUTION

3.1 INSTALLATION

Signs must be installed plumb and true and in accordance with approved manufacturer's instructions at locations shown on the detail drawings. Submit six copies of operating instructions outlining the step-by-step procedures required for system operation. The instructions must include simplified diagrams for the system as installed, the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Each set must be permanently bound and must have a hard cover. The following identification must be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS", name and location of the facility, name of the

Contractor, and contract number. Mounting height and mounting location must conform to 36 CFR 1191. Required blocking must be installed. Signs on doors or other surfaces must not be installed until finishes on such surfaces have been installed. Signs installed on glass surfaces must be installed with matching blank back-up plates in accordance with manufacturer's instructions.

Do not install items that show visual evidence of biological growth.

3.1.1 Anchorage

Anchorage must be in accordance with approved manufacturer's instructions. In high humidity interior spaces (for example, bathrooms, locker rooms, pools, trainers) and unconditioned spaces, use corrosion-resistant anchors/fasteners or with approval by the manufacturer, waterproof silicone adhesive. Anchorage not otherwise specified or shown must include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood. Exposed anchor and fastener materials must be compatible with metal to which applied and must have matching color and finish. At interior applications in heavy traffic areas, firmly attach signage to structure walls with tamper-proof fasteners.

a. Signs mounted to painted gypsum board surfaces must be removable for painting maintenance.

b. Mount signs mounted to lay-in ceiling grids with clip connections to ceiling tees.

c. Install signs mounted on metal surfaces with magnetic tape.

d. Install signs mounted on fabric surfaces with hook and loop tape or pin mount.

3.1.2 Protection and Cleaning

Protect the work against damage during construction. Hardware and electrical equipment must be adjusted for proper operation. Glass, frames, and other sign surfaces must be cleaned at completion of sign installation in accordance with the manufacturer's approved instructions and the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA, Package 1. Submit six copies of maintenance instructions listing routine procedures, repairs, and guides.

-- End of Section --

SECTION 10 22 13

WIRE MESH PARTITIONS
08/16, 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 IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wire Mesh Partitions

Show layout, details, materials, dimensions, finishes, and all information necessary for fabrication and installation.

SD-03 Product Data

Wire Mesh Partitions

Submit for each type of partition, door, and window.

Recycled Content for Metal Post and Framing Materials; S

Recycled Content for Wire Materials; S

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials in manufacturer's original, unopened containers or packaging with labels intact and legible. Deliver, store, and handle materials so as to prevent damage. Replace damaged or defective materials with new.

1.4 DESCRIPTION OF WORK

Wire mesh partitions must be all wire type, normal duty for normal industrial use. Provide partitions complete with fasteners, capping bars, adjustable floor sockets, bracing, doors, service windows, hardware, and other items necessary for a complete, useable, and rigid installation.

Furnish wire mesh partitions for Alchol Storage, Mark 201. Nominal partition height is 8 feet, 6 inches.

PART 2 PRODUCTS

2.1 MATERIALS

Metal post and framing materials listed below must contain a minimum of 15 percent post-consumer recycled content and wire materials must contain a minimum of 50 percent post-industrial recycled content. Provide data identifying percentage of recycled content for metal post and framing materials. Also provide data identifying percentage of recycled content for wire materials.

2.1.1 Steel Shapes, Plates, and Bars

ASTM A36/A36M.

2.1.2 Cold-Formed Steel

AISI SG03-3.

2.1.3 Wire Mesh

Carbon steel wire, woven diamond mesh, intermediate crimped.

2.1.4 Floor Sockets

Cast or forged steel or ductile iron, adjustable, approximately 2-1/2 inches high.

2.2 HEAVY DUTY PARTITIONS

2.2.1 Wire Mesh

6 gage wire, 2 inch mesh.

2.2.2 Panel Frames

1-1/2 by 3/4 by 1/8 inch steel channels.

2.2.3 Center Reinforcing Bar

One 1-1/2 by 3/4 by 1/8 inch channel with all wires woven through, or two 1-1/4 by 3/8 by 1/8 inch channels bolted together with mesh in between.

2.2.4 Capping Bar

Structural steel channel, 3 inch by 4.1 pounds.

2.2.5 Corner Posts

Structural steel angles, 1-3/4 by 1-3/4 by 1/8 inch.

2.2.6 Line Posts

Unless otherwise indicated, provide partitions with flat bar line posts bolted between vertical frame channels. Sizes of posts must be as follows:

Partition Height	Size of Posts
7 feet to 12 feet	2-1/2 by 5/16 inch
12 feet to 16 feet	3 by 5/16 inch or 2-1/2 by 3/8 inch
16 feet to 20 feet	3-1/2 by 5/16 inch

2.3 SLIDING DOORS

Frames must be 1-1/2 by 3/4 by 1/8 inch channels with 1-1/2 by 1/8 inch flat bar cover all around. Provide two four-wheel, roller bearing hangers and steel box track for each door.

2.4 DOOR OPENING FRAMES

Provide frames the same size and shape as the vertical frames for the mesh panels.

2.5 LOCKS

Provide each door with a mortise type lock with a seven-pin tumbler lock cylinder on the outside and a recessed knob on the inside.

2.6 SERVICE WINDOWS

Slide up type, mounted in standard mesh panel reinforced with channel tracks. Opening must be 24 inches wide by 15 inches high unless otherwise indicated. Provide two spring loaded latches, operable only from the inside, to lock window in open and closed positions.

2.7 FABRICATION

2.7.1 Standard Panels

Wire must be woven into diamond mesh, intermediate crimped, and securely clinched to frames. Joints must be mortised and tenoned. Wire must be continuous at center reinforcing bars, either woven through a single channel or bolted between two channels. Panel vertical frames must have 1/4 inch bolt holes 12 inches o.c. for normal duty partitions.

2.7.2 Doors

Construction must be similar to that specified for panels. Wire mesh must be the same as that used in the adjacent partition panels.

2.7.3 Finish

Thoroughly clean ferrous metal, treat with phosphate, and paint with gray enamel in the shop.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wire Mesh Partitions

Install plumb, level, and true to line, within a tolerance of 1/8 inch in

10 feet or the height or run of the partition, if less than 10 feet. Anchor floor sockets to the floor with expansion bolts. Bolt vertical frames and posts together with 1/4 inch bolts 12 inches o.c. for normal duty partitions. Secure top frames to a continuous capping bar with 1/4 inch diameter U bolts not more than 28 inches o.c.

3.1.2 Doors

Install in accordance with the manufacturers' recommendations. Adjust as required so that doors and hardware operate freely and properly.

3.1.3 Bracing

Brace free standing partitions more than 20 feet in length, at intervals not greater than 20 feet with a steel channel brace connected to the capping bar and anchored to the building wall or framing member.

3.1.4 Touch-Up

Clean and paint scratches, abrasions, and other damage to shop painted surfaces to match the shop-applied finish.

Repair minor surface rust areas. Clean and prime with rust inhibitive primer paint. Apply final paint to match shop-applied finishes.

3.1.5 HARDWARE SCHEDULE

Door Type	Clear Opening Dimensions
Sliding door leaf	4 feet, 6 inches by 8 feet, 6 inches

Interior Openings

HWS-22 Sliding Door Leaf		
	2 each Four Wheel, Ball Bearing Trucks	626
	1 each Recessed Knob	630
Section 08 71 00	1 each Mortise Cylinder Housing, F25 E09251	630
Section 08 71 00	1 each 7 Pin SFIC, F24, E09241	630

Note: Quantity of 1

-- End of Section --

SECTION 10 26 00

WALL AND DOOR 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.

ASTM INTERNATIONAL (ASTM)

ASTM A240/A240M	(2024b) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) 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

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Corner Guards

SD-03 Product Data

Corner Guards

SD-04 Samples

Finish

SD-06 Test Reports

Corner Guards

SD-07 Certificates

Corner Guards

Indoor air quality for adhesives

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality

1.3.1.1 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 program 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

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Keep materials dry, protected from weather and damage, and stored under cover. Materials must be stored at approximately 70 degrees F for at least 48 hours prior to installation.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

To the maximum extent possible corner guards must be the standard products of a single manufacturer and must be furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown will be acceptable.

2.2 CORNER GUARDS

2.2.1 Resilient Corner Guards

Corner guard units must be flush mounted type, radius formed to profile shown. Corner guards must extend from floor to ceiling. Mounting hardware, cushions, and base plates must be furnished. Assembly must consist of a snap-on corner guard formed from high impact resistant resilient material, mounted on a continuous aluminum retainer. Extruded aluminum retainer must conform to ASTM B221, alloy 6063, temper T5 or T6. Provide aluminum components that contain a minimum of 35 percent recycled content. Flush mounted type guards must act as a stop for adjacent wall finish material. Factory fabricated end closure caps must be furnished for top and bottom of surface mounted corner guards. Flush mounted corner guards installed in fire rated wall must maintain the rating of the wall. Insulating materials that are an integral part of the corner guard system must be provided by the manufacturer of the corner guard system. Exposed metal portions of fire rated assemblies must have a paintable surface.

2.2.2 Stainless Steel Corner Guards

Stainless steel corner guards must be fabricated of 16 gauge thick material conforming to ASTM A240/A240M, type 302 or 304. Stainless steel corner guards must be flush mounted. Corner guards must extend from floor to ceiling. Edges of corner guards must be finished to a smooth edge with no cut, unfinished edges showing. Install corner guards in locations as indicated on the drawings. Refer to drawings for finish.

2.3 TRIM, FASTENERS AND ANCHORS

Provide vinyl trim, fasteners and anchors for resiliant installation as shown. Provide stainless steel trim, fasteners and anchors for stainless steel corner guards. All trim, fastners and anchors must be concealed after installation.

2.4 FINISH

Submit three samples indicating color and texture of materials requiring color and finish.

2.4.1 Stainless Steel Finish

Finish for stainless steel must be in accordance with ASTM A240/A240M, Type 302 or 304, finish number 4.

2.5 ADHESIVES

Adhesive for metal material must be in accordance with manufacturers recommendations. Corner guard must be flush mounted and mechanically fastened. All mounting hardware must be hidden with finished product. Provide sealants and 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) the VOC content requirements of SCAQMD Rule 1168, or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

2.6 COLOR

Color must be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth.

3.1.1 Corner Guards

Material must be mounted at location indicated in accordance with manufacturer's recommendations.

3.1.2 Stainless Steel Guards

a. Mount guards on external corners of interior walls, partitions and columns as in accordance with manufacturer's recommendations for a flush, mechanically fastened installation.

b. Where corner guards are installed on walls, partitions or columns finished with plaster on steel or wood stud, anchor corner guards with number 10 1 1/2 inch S/S flat head wood screws. Coat back surfaces of corner guards, where shown, with a non-flammable, sound deadening material. Corner guards must overlap finish plaster surfaces.

c. Where corner guards are installed on exposed structural glazed facing tile units or masonry wall, partitions or columns, anchor corner guards with number 10 X 1 1/2 inch S/S flat head wood screw and AF-8 plastic anchors. Grout spaces solid between guards and backing with portland cement and sand mortar.

-- End of Section --

SECTION 10 28 13

TOILET ACCESSORIES
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 C1036	(2021) Standard Specification for Flat Glass
ASTM C1503	(2018) Standard Specification for Silvered Flat Glass Mirror

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-1691	(1994; Rev F) Construction and Material Schedule for Military Medical and Dental Facilities

1.2 SUBMITTALS

Government approval is required for all submittals.. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Product Schedule

Submit product Schedule indicating types, quantities, sizes, and installation locations by room for each toilet accessory item required. Identify locations using room designations indicated on the drawings.

SD-03 Product Data

Recycled content for stainless steel toilet accessories

Sanitary Napkin Disposal (SND), SS, Surface Mounted

Grab Bar (GB36) (GB42), 1-1/4 inch Dia., SS, 2 Wall, W/C Accessible

Grab Bar: L-Shaped (GBL), 1-1/4 inch Dia., SS, 2 Wall, Shower Use

Shelf, Mop and Broom Holder (MHS), SS, Surf Mntd

Robe Hook (RH), Security

Shower Curtain Rod (SCR), 1 inch Diameter, W/Curtain & Hooks

Toilet Tissue Dispenser (TTD), SS, 2-Roll, Surface Mntd

Mirror (WM)

Foam Soap Dispenser (SD)

Semi Recessed Waste Receptacle and Paper Towel Dispenser (ITDW)

Shower Seat (FSS)

Submit catalog numbers, literature, data sheets, construction details, profiles, anchoring and mounting requirements ,including cutouts in other work and substrate preparation and other pertinent data for each toilet accessory item to evaluate function, materials, dimensions and appearance.

SD-10 Operation and Maintenance Data

Sanitary Napkin Disposal (SND), SS, Surface Mounted

Grab Bar (GB36) (GB42) Grab Bar, 1-1/4 inch Dia., SS, 2 Wall, W/C Accessible

Grab Bar: L-Shaped (GBL), 1-1/4 inch Dia., SS, 2 Wall, Shower Use

Shelf, Mop and Broom Holder (MHS), SS, Surf Mntd

Robe Hook (RH), Security

Shower Curtain Rod (SCR), 1 inch Diameter, W/Curtain & Hooks

Toilet Tissue Dispenser (TTD), SS, 2-Roll, Surface Mntd

Mirror (WM)

Foam Soap Dispenser (SD)

Semi Recessed Waste Receptacle and Paper Towel Dispenser (ITDW)

Shower Seat (FSS)

Submit Data Package 1 for each toilet accessory item in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

1.3 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.4 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of one year from date of final acceptance of the work..

PART 2 PRODUCTS

2.1 ACCESSORY ITEMS

Provide toilet accessories where indicated in accordance with Contractor-provided product schedule. Conform to the requirements for accessory items specified herein which are based on MIL-STD-1691 Joint Schedule Numbers (JSN). Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

Provide stainless steel products listed herein manufactured from materials containing a minimum of 50 percent recycled content. Provide data identifying percentage of recycled content for stainless steel toilet accessories.

2.1.1 Anchors and Fasteners

Provide corrosion-resistant anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide oval heads exposed fasteners with finish to match the accessory. Provide fasteners proposed for use for each type of wall construction and mounting.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:

Metal	Finish
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

2.1.3 Sanitary Napkin Disposal (SND) , SS, Surface Mounted

Surface mounted sanitary napkin receptacle. Unit made of stainless steel with satin finish and all welded construction. Unit has piano hinge attached at the top and an integral finger depression for opening. For use with disposable paper liners, available separately. Unit may be attached to wall or toilet partition.

Approximate size: 7 inches wide by 4 inches deep by 10 inches high.

2.1.4 Grab Bar(GB36) (GB42) Grab Bar, 1-1/4 Inch Diameter, SS, 2 Wall, W/C Accessible

Grab bar of 1-1/4 inch diameter satin finish stainless steel with peened gripping surface for use in toilet stall/room. Snap-on flange covers for concealed mounting are stainless steel and equipped with two screw holes for attachment to wall. Grab bars designed to meet and exceed ADA requirements for structural strength. Grab bars designed to withstand loads of 900 pounds when properly installed. Clearance from wall to grab bar is 1-1/2 inches to meet ADA and ANSI codes.

2.1.5 Grab Bar: L-Shaped (GBL), 1-1/4 Inch Diameter, SS, 2 Wall, Shower Use

Grab bar of 1-1/4 inch diameter satin finish stainless steel with peened gripping surface. Snap-on flange covers for concealed mounting stainless steel. Bent ends of tubing pass through the flanges and are Heliarc welded for maximum strength. Grab bars designed to meet and exceed ADA requirements for structural strength. Grab bars designed to withstand loads of 900 pounds when properly installed. Clearance from wall to grab bar is 1-1/2 inches to meet ADA and ANSI codes.

2.1.6 Shelf, Mop and Broom Holder (MHS), SS, Surf Mounted

Surface mounted mop/broom holder with shelf made of 18 gauge stainless steel with all exposed surfaces in satin finish. Unit has shelf 8 inches deep with shelf support brackets of satin finish stainless steel welded to mounting base, and a minimum of 3 hooks/3 holders. Mop holders have spring-loaded rubber cams and hold mop or broom handle with a diameter between 5/8 inch and 1 inch.

Approximate size: 36 inches wide by 8 inches deep.

2.1.7 Robe Hook (RH), Security

Surface mounted safety hook made of stainless steel and secured to wall with tamper resistant mounting screws, exposed mounting. Mounting hardware to be included. Hook designed to snap down when it exceeds load limit.

2.1.8 Shower Curtain Rod (SCR), 1 Inch Diameter, W/Curtain & Hooks

Shower Curtain Rod with concealed mounting. Shower curtain rod made of satin finish stainless steel, 1 inch diameter, with flanges included, and have white vinyl shower curtain, 72 inches high, and stainless steel curtain hooks. Shower curtain has corrosion resistant grommets, reinforced heading, and treated with antibacterial and flame retardant agents. Shower hooks are stainless steel. Length as indicated on drawings.

2.1.9 Toilet Tissue Dispenser (TTD), SS, 2-Roll, Surface Mounted

Jumbo dual roll toilet paper holders for surface mounting are 0.050 inch, 18 gauge Type 304 stainless steel that accommodates two, 9 inch paper rolls with cores of 3 inches in diameter. A smaller, 2.25 inches core size roll is accommodated by removing core adapters. Replace the first roll by shifting a panel lever at unit bottoms to engage the second roll. Units automatically reset to the first roll during maintenance access. Unit door is constructed of a single, seamless piece with integral ribs, two tissue viewing slots and secured with a tumbler lock. Provide two keys per unit. Hinges are a heavy duty, stainless steel pivot type. Dispensing mechanisms are fabricated of high impact, chemical and flame retardant ABS plastic. Dimensions are 1 foot, 8.8125 inches wide, 11.375 inches high and projecting 6.1875 inches.

2.1.10 Mirror (WM)

Mirror frames are 0.050 inch, 18 gauge Type 304 stainless steel angles fabricated into 0.75 inch by 0.625 inch channels with mitered, heilarc welded corners that are ground and polished smooth. Concealed members are corrosion protected steel. Fabricate mirror backs with 0.036 inch, 20

gauge back panels incorporating 0.050 inch, 18 gauge mounting brackets interlocked with frame tops and bottoms. Place filler material at mirror edges, and between mirrors and back panels. Mirrors are first quality, electrolytic copper backing on 0.25 inch plate or float glass, complying with ASTM C1036 and ASTM C1503.

Approximate size: 1 foot, 6 inches wide by 3 feet, 0 inches high.

2.1.11 Foam Soap Dispenser (SD) Surface Mounted

Foam soap dispensers have chrome plated, ABS plastic valves incorporated into 0.038 inch, 20 gauge Type 304 stainless steel bodies and backs. Wall plates are stainless steel. Units have 40 fluid ounces of capacity, and are top filled through locked openings. Surface mount with a vertical orientation. Valves actuate with no more than 5 pounds of pressure. Furnish tamper resistant sight level indicators. Provide two keys per unit.

Approximate size: 4.8125 inches wide by 8.25 inches high by 2.825 inches deep and valves project 1.6875 inches.

2.1.12 Semi Recessed Waste Receptacle and Paper Towel Dispenser (ITDW)

Semi recessed waste receptacle and paper towel dispenser units hold 800 multi-fold or 600 C-fold paper towels. Waste receptacles accommodate 12 gallon liners. Unit doors, frames, waste containers and cabinets are 18-8 alloy, Type 304 stainless steel. Unit doors and backs are 0.050 inch, 18 guage, and other fabrications are 0.031 inch, 22 gauge. Exposed surfaces are protected by PVC film. Doors are fabricated of double pan construction with fiberboard filler, have full length, 0.1875 inch diameter multi staked, stainless steel piano hinges and are fit with tumbler locks. Provide two keys per unit. Towel dispensing slots have hemmed edges for user safety. Waste containers have hemmed edges and are secured with tumbler locks. Face trims are 1 inch in width and formed from a single piece free of miters, welds and open seams with a 0.25 inch square return to walls. Structural components are of welded construction. Cabinet fasteners and spot welds are concealed. Labeling provides operating instructions.

Outside flange dimensions are 1 foot, 5.25 inches wide, 4 feet, 8 inches high and recessed 1.25 inches into wall substrates. Units project 2.75 inches from wall faces.

2.1.13 Shower Seat (FSS)

Shower seats are ell shaped. Seat frame and support legs are 1 inch diameter and 1.25 inch square 0.050 inch, 18 gauge, Type 304 stainless steel with welded construction. Edges and corners are radiused and smooth. Mounting flanges are 0.188 inch, 7 gauge and guide brackets and arm supports are 0.063 inches, 16 gauge. Seat planks are 0.5 inch solid phenolic. Support arms fold upward into a vertical, retracted position without need for latches or fittings to retain the position. Guide brackets control seat raising and lowering with a stainless steel spring mechanism. Dimensions are 2 feet, 9 inches wide and projecting 1 foot, 10.825 inches.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Provide oval exposed screw heads. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with corrosion-resistant fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs, or to backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

SECTION 10 44 16

FIRE EXTINGUISHERS
11/19

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fire Extinguishers;

Accessories;

Cabinets;

Schedule;

SD-03 Product Data

Fire Extinguishers;

Accessories;

Cabinets; ;

Replacement Parts List;

1.2 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction.

Deliver materials in their original packages, containers, or bundles bearing the brand name and the name and type of the material.

1.3 PROJECT SCHEDULE

For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

PART 2 PRODUCTS

Submit fabrication drawings consisting of fabrication and assembly details performed in the factory and product data for the following items: Accessories, cabinets, Wall Brackets.

2.1 SYSTEM DESCRIPTION

2.1.1 Material

Provide enameled steel extinguisher shell.

2.1.2 Size

10 pounds extinguishers.

2.1.3 Accessories

Forged brass valve

Fusible plug

Safety release

Pressure gage

2.2 EQUIPMENT

2.2.1 Cabinets

2.2.1.1 Material

Provide enameled steel or aluminum cabinets.

2.2.1.2 Type

Provide recessed type cabinets.

2.2.1.3 Size

Dimension cabinets to accommodate the specified fire extinguishers.

PART 3 EXECUTION

3.1 INSTALLATION

Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

Comply with the manufacturer's recommendations for all installations.

3.2 PROTECTION

3.2.1 Repairing

Remove and replace damaged and unacceptable portions of completed work with new work at no additional cost to the Government.

Submit replacement parts list indicating specified items replacement part, replacement cost, and name, address and contact for replacement parts distributor.

3.2.2 Cleaning

Clean all surfaces of the work, and adjacent surfaces which are soiled as a result of the work. Remove from the site all construction equipment, tools, surplus materials and rubbish resulting from the work.

-- End of Section --

SECTION 10 51 13

LOCKERS
08/24

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 A1008/A1008M	(2024) 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 D3451	(2006; R 2017) Standard Guide for Testing Coating Powders and Powder Coatings
ASTM D4976	(2012; R 2020) Standard Specification for Polyethylene Plastics Molding and Extrusion Materials

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-PRF-22750	(2014; Rev G; Notice 1 2019) Coating, Epoxy, High Solids
MIL-PRF-23377	(2012; Rev K) Primer Coatings: Epoxy, High Solids

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS AA-L-00486	(Rev J) Lockers, Clothing, Steel

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

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Types

Location

Installation

Numbering System

SD-03 Product Data

Material

Locking Devices

Handles

Finish

Locker Components

Assembly Instructions

SD-04 Samples

Color Chips

1.3 DELIVERY, HANDLING, AND STORAGE

Deliver lockers and associated materials in their original packages, containers, or bundles bearing the manufacturer's name and the name of the material. Protect from weather, soil, and damage during delivery, storage, and construction.

1.4 FIELD MEASUREMENTS

To ensure proper fits, make field measurements prior to the preparation of drawings and fabrication. Verify correct location.

1.5 QUALITY ASSURANCE

1.5.1 Color Chips

Provide a minimum of three color chips, not less than 3 inches square, of each color indicated.

Government may request performance-characteristic tests on assembled lockers. Tests and results must conform to FS AA-L-00486. Tests and results for HDPE lockers must conform to applicable requirements of ASTM D4976 and applicable requirements of FS AA-L-00486. Lockers not conforming will be rejected.

PART 2 PRODUCTS

2.1 ACCESSIBILITY

Comply with 36 CFR 1191 with regard to accessibility of lockers, locker features, latching and locking, and signage.

2.2 TYPES

Locker must have the following type and size in the location and quantities indicated. Locker finish colors will be as scheduled.

Mail, Parcel and Pharmacy lockers must be manufactured as fully welded steel and full height prefabricated solid high-density polyethylene (HDPE) units.

2.2.1 Full Height

Full Height lockers must be as follows:

Type DTC-2: Full Height locker 15 inches wide, 18 inches deep, and 72 inches high, attached to a 6-inch high closed base

2.2.2 Mail, Parcel and Pharmacy Lockers

Mail, Parcel and Pharmacy lockers must be as follows:

Lockers must be made of steel and must be lockable.

Lockers must be pass-through.

Refer to drawings for configurations.

2.3 MATERIAL

2.3.1 Galvanized Steel Sheet

ASTM A1008/A1008M, commercial quality, minimized spangle material. Prepare material surfaces for baked enamel or powder coat finishing in accordance with FS AA-L-00486. Fabricate locker bodies from not less than 0.0239-inch thick steel sheet..

2.3.2 Solid High-Density Polyethylene (HDPE)

ASTM D4976 solid 3/8 inch HDPE panels, extrusions, and casting forming locker bodies, doors, and shelves. Include bases, sloped tops, end panels, and infill panels.

2.3.3 Finish

FS AA-L-00486.

ASTM D3451.

Primer, MIL-PRF-23377; topcoat, MIL-PRF-22750.

2.3.3.1 Color

As selected.

2.4 COMPONENTS

2.4.1 Built-In Locks

FS AA-L-00486. Provide locking devices as built-in key locks.

2.4.2 Coat Hooks

FS AA-L-00486, stainless steel.

2.4.3 Hanger Rods

FS AA-L-00486,stainless steel.

2.4.4 Door Handles

FS AA-L-00486. Provide chromium plated zinc alloy or steel handles.

2.4.5 Doors

FS AA-L-00486, not less than 0.0598 inch thick steel sheet. Provide closed face.

2.4.5.1 Hinges

In addition to the requirements of FS AA-L-00486, provide 5-knuckle hinges, minimum 2 inches high. Fabricate knuckle hinges from not less than 0.0787 inch thick steelstainless steel. A full height piano hinge may be provided if standard with the manufacturer. Weld or bolt hinges to the door frame to suit materials. Weld, bolt, or rivet hinges to the door to suit materials.

2.4.5.2 Latching Mechanisms

FS AA-L-00486.

2.4.6 Latch Strikes

FS AA-L-00486. Fabricate from not less than 0.0787 inch thick stainless steel sheet, except latch strike must be continuous from top to bottom and fabricated as part of the door framing. Provide no less than two silencers per door strike.

2.4.7 Solid HDPE Latches

Provide recessed door latch assembly of solid HDPE with latching devices compatible with the locker body construction. Include necessary metal components to provide latching and locking function with latches engaging the locker body at two locations for double tier doors and three locations for single tier full height doors.

2.4.8 Silencers

FS AA-L-00486.

2.4.9 Back and Side Panels, Tops, and Bottoms

FS AA-L-00486, not less than 0.0474 inch thick steel sheet 1/2 inch solid HDPE panel. Provide concealed anchored filler pieces and boxed end panels where indicated that match side panel material.

2.4.10 Sloping Locker Tops

Provide sloping locker tops in addition to the locker-section flat tops. Sloping tops must be continuous in length. Provide fillers or closures at the exposed end of sloping tops. Fabricate sloping tops from not less than 0.0478-inch thick steel sheet.

2.4.11 Shelves

FS AA-L-00486. Fabricate from not less than 0.0598 inch thick steel sheet.

2.4.12 Base Panels

FS AA-L-00486.

2.4.13 Legs

FS AA-L-00486.Provide lockers without legs, as indicated.

2.4.14 Number Plates

FS AA-L-00486. Aluminum. Provide consecutive numbers.

2.4.15 Label Holders

FS AA-L-00486.

2.4.16 Fastening Devices

Provide bolts, nuts, and rivets as specified in FS AA-L-00486.

PART 3 EXECUTION

3.1 ASSEMBLY AND INSTALLATION

Assemble lockers according to the locker manufacturer's instructions. Align lockers horizontally and vertically. Secure lockers to wall and base with screws as indicated. Bolt adjacent lockers together. Adjust doors to operate freely without sticking or binding and to ensure they close tightly. Recessed Mail Lockers and Parcel Lockers are to be furnished and installed by the contractor.

3.2 NUMBERING SYSTEM

Install number plates on lockers consecutively.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing

Government may request performance-characteristic tests on assembled lockers in accordance with FS AA-L-00486. Lockers not conforming will be rejected.

3.3.2 Repairing

Remove and replace damaged and unacceptable portions of completed work with new.

3.3.3 Cleaning

Clean surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner. Remove equipment, surplus materials, and rubbish from the site.

-- End of Section --

SECTION 11 05 40

COMMON WORK RESULTS FOR RELOCATING FOODSERVICE EQUIPMENT
08/17, CHG 1: 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.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.15	(2024) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2021) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(2021) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(2018) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2019) Specification for Filler Metals for Brazing and Braze Welding

ASTM INTERNATIONAL (ASTM)

ASTM A269/A269M	(2022) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A270/A270M	(2023) Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing
ASTM A276/A276M	(2017) Standard Specification for Stainless Steel Bars and Shapes
ASTM A666	(2023) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B43	(2020) Standard Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B88	(2022) Standard Specification for Seamless Copper Water Tube

ASTM C920	(2018; R 2024) Standard Specification for Elastomeric Joint Sealants
ASTM C1330	(2023) Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM D520	(2000; R 2011) Zinc Dust Pigment

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code

NSF INTERNATIONAL (NSF)

NSF/ANSI 14	(2023) Plastics Piping System Components and Related Materials
NSF/ANSI 51	(2023) Food Equipment Materials

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910-SUBPART D	Walking - Working Surfaces

UNDERWRITERS LABORATORIES (UL)

UL 197	(2010; Reprint Mar 2023) UL Standard for Safety Commercial Electric Cooking Appliances
UL 471	(2010; Reprint Sep 2019) UL Standard for Safety Commercial Refrigerators and Freezers

1.2 GENERAL REQUIREMENTS

Disconnect, disassemble, relocate and reinstall selected equipment as indicated.

1.2.1 Mechanical General Requirements

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this section.

Section 22 00 00 PLUMBING, GENERAL PURPOSE applies to this section. Coordinate the location of drainage receptacles with food preparation equipment requiring plumbing connections. All plastics and piping system components must conform to NSF/ANSI 14. Materials must conform to NSF/ANSI 51.

1.2.2 Electrical General Requirements

All electrical work must conform to NFPA 70, and NEMA 250.

1.3 DESCRIPTION OF WORK

The work includes disconnecting, disassembling, relocating and reinstalling food service preparation equipment and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Advise the Contracting Officer of all discrepancies prior to disconnecting equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting addressing the following:

a. Field verify all horizontal and vertical dimensions.

b. Review contract drawings and submittal data for accuracy and completeness.

c. Field check installed utility capacity and location.

d. Review critical systems/components for application and capacities such as for water, and steam/condensate line sizes and manifold configurations.

e. Coordinate and verify relocations for access through finished openings and vertical handling limitation within the building.

f. Assess equipment before disconnecting. Provide a food service equipment technician to test and adjust controls and safeties. Check the general mechanical operation of pumps and motors. Report malfunctions.

Provide rough-in and connect utilities to equipment in accord with requirements specified in other sections of this specification and in accord with the physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

1.3.1 Design Requirements

Submit detail drawings for all food service and storage equipment connections. Drawings must be 1/4 inch scale minimum.

Submit . Drawings must show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work, including clearances for maintenance and operation.

a. Detail drawings by Contractor must be separate drawings and be the Contractor's standard sheet size, but not smaller than the contract drawings, indicating food service equipment and cold storage assemblies with wall openings, blockouts, ceiling pockets, blocking grounds,access panels, rough-in plumbing/mechanical systems and rough-in electrical systems.

b. Prepare and submit detail drawings that show the size, type, and location of equipment drain lines, and floor drains. Indicate drain lines from equipment, distances of drain lines and floor drain receptacles from equipment and aisles, and elevation views of drain

piping and floor drains.

1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data;

SD-02 Shop Drawings

Food Service Equipment Utilities Coordination Plan;

SD-06 Test Reports

Field Test Reports

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

Thirty days prior to the commencement of work, notify the Contracting Officer that the following items are prepared and ready for review:

a. Preconstruction Submittals:

(1) Contractor's Field Verification Data

(2) Food service equipment utilities coordination plan

1.6 DELIVERY, STORAGE, AND HANDLING

Unless otherwise directed, the following procedures apply:

1.6.1 Storage of Equipment and Accessories

Store and protect items to be restored to service from weather, humidity, and temperature variation, dirt and dust, or other contaminants.

1.6.2 Prohibited Use of Equipment

Do not use food service equipment as tool or material storage, work bench, scaffold, or stacking area.

1.6.3 Damaged Equipment

Immediately submit documentation to the Contracting Officer with a recommendation of action for repair or replacement and the impact on project schedule.

PART 2 PRODUCTS

2.1 MATERIALS

Floor areas adjacent to food preparation equipment point of operation, and working surfaces must conform to 29 CFR 1910-SUBPART D

2.1.1 Stainless Steel Pipe, Tubing and Bars

ASTM A269/A269M, ASTM A270/A270M, ASTM A666. Provide seamless or welded pipe and tubing, of the gauge specified, of true roundness, and of material as specified for stainless steel. Seamless tubing must be thoroughly annealed, pickled, and ground smooth. Welded tubing must be thoroughly heat-treated, quenched to eliminate carbide precipitation and then drawn true to size and roundness, and ground. Provide No. 3 or 4 finish tubing when exposed to view.

Provide bars conforming to ASTM A276/A276M, ASTM A666, Type 302 or Type 304 or Type 316.

2.1.2 Galvanizing Repair Compound

ASTM D520, Type I pigment.

2.1.3 Brazing and Braze Welding Material

AWS A5.8/A5.8M, class as applicable.

2.1.4 Brass Piping and Fittings

Pipe must conform to ASTM B43. Fittings must conform to ASME B16.15.

2.1.5 Copper Tubing and Fittings

Provide copper tubing conforming to ASTM B88, Type K, annealed, for buried or embedded in concrete installation and Type L, hard drawn, for above grade installation. Fittings must conform to ASME B16.18, above grade, ASME B16.22 or ASME B16.26, above or below grade.

2.1.6 Solder Material

ASTM B32, Sn96.

2.1.6.1 Lead-Free Solder

ASTM B32, 95.5 tin-antimony solder or other "lead-free" solder. Use for all potable water copper tubing and fitting connections, and for solder joints in contact with food.

2.1.6.2 Tin-Lead Solder

ASTM B32, alloy grade 50B for temperatures up to 150 degrees F and alloy grade 95TA for temperatures over 150 degrees F.

2.1.6.3 Silver Solder

AWS A5.8/A5.8M, 15 percent silver base brazing alloy, melting point not less than 1000 degrees F.

2.1.7 Sealants

Sealants must conform to the requirements of ASTM C1330, ASTM C920.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Prior to commencement of reinstallation, perform a complete walk down of the facility with the Contracting Officer to verify readiness for reinstallation.

Provide adequate protection of all finished surfaces, fixtures, and other equipment to prevent any damage during the installation work.

Conduct installation procedures conforming to applicable NSF, OSHA and UL standards specified.

Set all equipment plumb and level. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, or bases with stainless steel bolts.

Flash food service cabinets located in wall openings to the walls with 20 gage stainless steel. Seal around equipment flashing and flanges, at walls, floor, and ceiling in accord with Section 07 92 00 JOINT SEALANTS. Fillers must be continuous, without opening.

No drilling, cutting, burning, or welding of structural parts of building is permitted. Provide access panels for concealed valves, vent controls, and control devices and items requiring periodic operation, inspection, or maintenance.

3.1.1 Equipment Connections

Complete equipment connections for all utilities. Unless otherwise specified, provide stainless steel exposed piping. Provide access panels of sufficient size and so located that concealed items may be serviced and maintained or removed and replaced.

3.1.2 Electrical Work

Electrical systems, components and accessories must be certified to be in accordance with NFPA 70 and the following:

3.1.2.1 Installed Equipment Load

If the electrical load of the equipment differs from that specified or shown on the drawings, provide and install electrical service compatible with the equipment.

3.1.2.2 Electrical Equipment and Components

Food service equipment furnished under this section must have loads, voltages, and phases compatible with building system, and conform to manufacturer standards.

3.1.2.3 Cords and Caps

Coordinate all food service equipment cord/caps with related receptacles. All 120/208/240 volt "plug-in" equipment must have Type SO or SJO cord and a plug with ground, fastened to frame/body of item. Replace non conforming cords. Provide mobile equipment with a strain-relief assembly at the cord connection of the appliance. Mobile electrical support equipment and counter appliances mounted on mobile stands must have cord/cap assembly with cord-hangers.

3.1.2.4 Switches and Controls

Equip each motor-driven appliance or electrically-heated unit with control switch and overload protection per UL 197 and UL 471. Switches, controls, control transformers, starters, equipment protection and enclosures must be Industry Standards for the related equipment environment.

3.1.2.5 Final Electrical Connection Provisions

Tag final electrical connection points of equipment with item number, name of devices on the circuit, total electrical load, voltage, and phase. Fabricated equipment containing electrically-operated components or fittings, indicated on utility connections drawings to be direct-connected, must have each component, fitting, or group thereof prewired to a junction box for final connection. Refer to the drawings for circuit loading.

Field-assembled equipment (example, prefabricated cold storage assemblies, conveyor systems, exhaust hoods) must have electrical components completely interconnected by this section for final connection as indicated on utility connection drawing.

3.1.3 Plumbing Work

Tag all plumbing final connection points of equipment, indicating item number, name of devices or components, and type of utility (water, steam, drain). Provide extensions of indirect waste fitting to open-sight hub drain, floor sink or floor drains from food service equipment.

3.1.3.1 Steam Connection Provisions

Provide all steam-injected equipment with a steam inlet globe control valve with cold handle, relief valve, strainer, condensate gate valve, bucket steam trap, and swing check valve. Compartment steam cookers must have piping manifolded from all compartment exhaust valves to a floor drain, floor sink, or drain trench. Provide steam generators specified within this section with automatic boiler blowdown and a cold water condenser. Separate equipment, devices or components indicated to be connected to a steam-generator, provided under this section, must be provided with all unions, ells, gate valves, nipples, brackets, clamps, etc., required for the complete operating system for final connection.

Steam supply piping must be insulated with 1 inch fiberglass insulation (3 pounds/cubic foot density) and have factory-applied fire retardant. Install a full-length 16 gauge stainless steel pipe enclosure with sloping top, jacket, and vapor barrier over steam lines.

3.2 EQUIPMENT RESTARTING

Furnish a food service equipment technician trained to perform the services specified. The manufacturers representatives must provide advice and services on the following matters:

Perform equipment start up and testing. Replace malfunctioning controls and components. Check the general mechanical operation of pumps and motors. Perform preventative maintenance, including but not necessarily limited to, lubricating oil bearings; and check electric motor rotation. Correct equipment malfunctions and make adjustments to provide smoothly operating systems.

Restart equipment and train Government personnel as to its proper care, operation, maintenance and safety procedures.

3.3 LOCATIONS AND CLEARANCES

Locate equipment to provide working space for necessary servicing such as shaft removal, disassembling, 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, lubrication, oil draining and working clearance.

3.4 IDENTIFICATION TAGS AND PLATES

Provide equipment with tags numbered and stamped for their use. Provide brass or non-ferrous plates and tags. Minimum letter and numeral sizes are 1/8 inch high.

3.5 INSTRUCTIONS TO GOVERNMENT PERSONNEL

Prepare and conduct a training course for the operating staff as designated by the Contracting Officer. The training must consist of a total 1 hour of normal working time and start after the system is functionally completed but prior to final acceptance tests. Demonstrate routine maintenance operations. Notify the Contracting Officer at least 14 days prior to date of proposed conduction of the training course.

3.6 TESTS

Perform the tests including everything required. Notify the Contracting Officer, in writing, 10 days before performing tests. Perform tests in the presence of a manufacturer's representative and Contracting Officer.

3.6.1 Initial Start-Up and Operational Test

Provide all lubricants and accessories before initial start-up. Start and operate all equipment. Follow the manufacturer's procedures and place the systems under all modes of operation. Supplement initial charges of lubricating oil to assure maximum operating capacity. Adjust all safety and automatic control instruments. Record manufacturer's recommended readings hourly.

3.6.2 Test Reports

Submit the final field test reports for each system tested, describing test apparatus, instrumentation calculations, and equipment data based on industry standard forms or reasonable facsimiles thereof. Where final

adjustments and settings cannot be permanently marked or drilled and pinned as an integral part of device, include adjustment and setting data in test report.

3.6.3 Cleaning and Adjusting

Test and adjust equipment for proper operation. Test rotating components and motors for proper rotation. Prior to acceptance of project, clean and sanitize equipment both inside and outside.

-- End of Section --

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SECTION 11 13 30

TOP OF GROUND DOCK LIFT
02/25

PART 1 GENERAL

1.1 SCOPE

Provide labor, material, equipment and services necessary for, and reasonably incidental to, furnishing and installing loading dock equipment work indicated within the Instruments of Service. Incorporate related accessories and specialties to accomplish a complete and proper installation. Coordinate and schedule this work with the work of other trades to ultimately provide superior workmanship in the finished product.

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2603	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI MH29.1	(2020) Safety Requirements for Industrial Scissors Lifts

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

TOP OF GROUND DOCK LIFTS

SD-03 Product Data

TOP OF GROUND DOCK LIFTS

SD-10 Operation and Maintenance Data

MAINTENANCE

SD-11 Closeout Submittals

WARRANTY

1.4 WARRANTY

Furnish the standard 10 year warranty of the manufacturer. Coverage is to

ensure that loading dock equipment structures are free of manufacturing defects in product design, material and workmanship.

Furnish the standard 2 year warranty of the manufacturer. Coverage is to ensure that loading dock equipment hydraulic assemblies are free of manufacturing defects in product design, material and workmanship.

PART 2 PRODUCTS

2.1 TOP OF GROUND DOCK LIFTS

2.1.1 ELECTRICAL

Equipment: 220 Volt, 1 Phase, 60 Hertz, 5 HP

2.1.2 DESCRIPTION

Top of ground dock lifts comply with ANSI MH29.1. Units include platform, steel tube scissor legs, bearings, perimeter guards, mounting brackets and a hydraulic lift with controls and safety devices. Ground dock lifts are supported by concrete equipment pads.

2.1.3 FABRICATION

Fabricate lifts from structural steel shapes rigidly welded and reinforced for strength, safety and stability. Assemblies are designed to withstand deformation during operation and while stationary at landings. Fabricate scissor mechanisms from heavy duty, formed steel tubes. Provide a baked enamel finish for steel members. Equip lifts with no less than two heavy duty, machine grade cylinders incorporating mechanical internal stops and reservoir return lines from breather vents. Cylinder rods are chrome plated and polished. Control flows to cylinders to prevent platform free fall. Bearings are lifetime lubricated. Hydraulic power units are self contained, remotely located assemblies with a steel fluid reservoir, motor, high pressure gear pump and manifold with pressure compensated flow control, down solenoid, check valve and relief valve features. Provide beveled steel toe guards on four sides of the unit base with 3 inches of vertical toe clearance between the platform and grade. Platforms are fabricated from heavy, safety tread steel plate. Bridges are of matching steel plate attached to the platform with continuous, heavy duty, throw over piano hinges. Store bridges with a retaining chain and snap during lift operation. Hinged ramps are similar. Enclose platforms with removable guards, 3 feet, 6 inches high, at non accessible edges and safety chains at edges accommodating travel. Electrical controls consist of constant pressure, UP and DOWN buttons housed within a NEMA rated enclosure that also accommodates a magnetic motor starter with three pole, adjustable overloads, and a 24 Volt, 4 Amp fused secondary control transformer.

2.1.4 FINISH

Give steel fabrications a pretreatment to enhance adhesion followed by a caustic etch or alkaline wash for cleaning and degreasing. Apply a phosphate spray or chromate conversion treatment to protect against humidity and corrosive chemicals. Furnish an acrylic, polyester baked enamel or powder coating treatment conforming AAMA 2603. Bake the treatment using a temperature and time relationship that ensures thorough curing and a tough, durable finish. Provide a one coat application that achieves a 0.8 mil thickness.

2.1.5 ACCESSORIES

Furnish fasteners, accessories and options as recommended by the manufacturer for the specific applications and substrates encountered within the work.

PART 3 EXECUTION

3.1 INSTALLATION

Shim equipment to provide flush and parallel alignment with adjoining dock surfaces. Secure dock lifts to concrete slabs.

3.2 EQUIPMENT START UP

Clean and convey equipment in new condition. Touch up scars and welds on factory finished surfaces with manufacturer supplied repair material. Adjust equipment for smooth and balanced operation. Operate equipment using recommended alignments. Test functional cycles.

3.3 MAINTENANCE

Submit the recommended maintenance practices for each type of installation provided.

3.4 TOP OF GROUND DOCK LIFT SCHEDULE

GDL-1 Loading Dock 223

1. Lift capacity: 5,500 pounds
2. Axel capacity: 2,750 pounds
3. Travel: Approximately 4 feet, 0 inches
4. Landings: 2 total
5. Power required: Dedicated circuit
6. Drive: Hydraulic cylinders
7. Motor: 5 HP, continuous duty, totally enclosed, fan cooled type
8. Speed: 13 FPM
9. Control unit location: Loading Dock 223
10. Carriage enclosure: Two sided, safety chains
11. Platform configuration: Combination wheel in, back out and 90 degrees turn travel
12. Platform size: 6 feet, 0 inches by 6 feet, 0 inches, nominal
13. Ramp size: 5 feet, 0 inches long by platform width
14. Bridge size: 1 foot, 6 inches long by platform length
15. Control stations: Surface mounted

3.5 TOP OF GROUND DOCK LIFT HARDWARE SCHEDULE

HARDWARE SETS

Exterior Locations

HWS-23 GDL Ground Dock Lift
Lift Control

Section 08 71 00	1 each	Key Switch, interior mounted	630
Section 08 71 00	1 each	Mortise Cylinder Housing, F25, E09251	626
Section 08 71 00	1 each	SFIC, F24, E09241	626
Section 08 71 00	1 each	Power Supply	600

Note: Furnish electric metallic tubing raceway, cabling, equipment and programming to support connected devices and operate overhead curtain components

Note: Furnish NEMA Type 4X enclosures for exterior door controls

Note: Quantity of 1

-- End of Section --

SECTION 12 00 01.00 20

FURNITURE, FIXTURES AND EQUIPMENT (FF&E) PACKAGE
02/23

PART 1 GENERAL

1.1 CONTRACTOR'S FURNITURE, FIXTURES AND EQUIPMENT (FF&E) HANDLING AND ADMINISTRATION RATE (HAR)

The HAR accounts for all administrative costs, overhead, FF&E subcontractor bonding fees deemed necessary by the Contractor, administration of subcontracts, profit, and any other costs associated with, and related to, the coordination and processing of the procurement and installation of FF&E. Offerors must propose a HAR for the FF&E not to exceed 5 percent. Do not include costs associated with INTERIOR DESIGN SERVICES in the HAR. The proposed HAR percentage is a fixed rate and will be incorporated into the contract award. The HAR will not be adjusted regardless of fluctuations from the estimate amount for the FF&E.

The Government will indicate the FF&E estimate in the FF&E Option Item in the Price Schedule based on the Concept FF&E Design. The Government estimated price is to provide Offerors with the projected magnitude of effort and includes the actual estimated cost of the FF&E including freight, installation, and other applicable vendor charges. The Government estimated price is only an estimated amount and must not be altered by the Contractor during the solicitation process.

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)

FC 1-300-09N	(2024) Navy and Marine Corps Design
UFC 3-120-10	(2018; with Change 2, 2021) Interior Design

1.3 DEFINITIONS - FF&E TURNKEY EFFORT

The Furnishings, Fixtures, and Equipment Package may include, but is not limited to; systems and modular furniture, workstations, desks, seating, storage, filing, visual display items, accessories, artwork, command graphics, training and conference furniture, soft window treatments (draperies, valances, and cornices), shop equipment, fitness equipment, Child Development Center furniture, appliances, portable weapons cabinets, dorm and quarters furnishings and other miscellaneous items to support facility functions. For NAVFAC PACIFIC projects, the term Collateral Equipment (CEQ) Package may be used interchangeably with the term FF&E Package.

The project may also include Specialty CEQ Package for which the Activity may assist in specifying items, which may include, but not limited to: Audio Visual (AV) equipment, commercial kitchen equipment, medical equipment and wharf equipment. For the purposes of this specification, if a Specialty CEQ Package is required, the same requirements identified for

the FF&E Package apply to the Specialty CEQ Package or as outlined by project-specific UFC or requiring Agency.

1.3.1 FF&E Option Item

As an option, provide procurement and installation coordination of the approved complete and usable Final FF&E Package.

a. The Specialty CEQ Package will be identified as a separate Option Item, priced separately from the FF&E and funded as a separate Option.

b. The Government is not obligated to award the FF&E Option Item. Should the Government choose to award the FF&E Option, the Item(s) will be awarded as a negotiated option to the contract or task order. The Contractor's proposed HAR will be applied to all vendor and supplier costs for the FF&E.

c. The Government will provide separate funding for procurement and installation coordination of the FF&E Package. Construction funds will not be used. Upon receipt of required funding, the Contracting Officer will authorize the Contractor, as an option to the construction contract, to provide the Government-approved Final FF&E Package exactly as specified and complying with priorities found in the Federal Acquisition Regulation (FAR) 8.404 Use of Federal Supply Schedules. The amount of the option will be the actual cost of these items from the Federal Government price schedules and, when necessary, Open Market sources. The option amount will also include shipping, freight, handling, installation, vendor design fees, project management fees, applicable sales tax, Contractor's FF&E Handling and Administration Rate percentage as applied to the Final FF&E or Specialty CEQ total cost(s) and the NAVFAC required bond fee.

d. If awarded, the FF&E Option Item will be awarded at least six months prior to the contract completion date. A minimum of six months is required for the Contractor to purchase, deliver and install the product without impacting the overall completion date of the project. The Contractor's schedule must assume the award of the FF&E as an option. Government Fiscal Year funding availability must be considered and incorporated into the FF&E Schedule. No schedule extensions will be granted if the option item is awarded at least six months prior to the contract completion date. If the Government decides to negotiate and award the option item with less than six months prior to the contract completion date, the Contractor may be entitled to a contract extension and extended field overhead. A contract extension and extended field overhead will only be granted in those cases where the Contractor demonstrates that the accepted Final FF&E Package was submitted within the approved schedule deadlines, sufficient lead time is not available, and the Government's award of the FF&E Option Item is within the last six months of the contract.

e. The FF&E Option Item (and any Specialty Equipment and Audio Visual (A/V) Option Item(s)) are exempt from NAVFAC Procedures, Guidance and Instruction (NPGI) 17.202(a)(ii) option restriction to award within 365 days of contract award. Per NPGI 17.202(a)(ii), Note 2, "Options for Collateral Equipment (CEQ) to include Furniture, Fixtures and Equipment (FF&E) and Audio-Visual (A/V) are not limited to the 365 day time period from date of award. Written approval for a longer period to exercise options for FF&E and A/V is not required."

1.3.2 Authorization for Use of Government Supply Sources

The Contracting Officer will authorize the Contractor to purchase the required products through the specified sources and will provide a letter of authorization to the Contractor in accordance with FAR 51.102 Authorization to use Government supply sources (e)(1) through (5) citing the name of the furniture dealer(s) and other information to use when accessing the Federal Government supply sources. The Contractor must procure and coordinate the installation of the approved Final FF&E Package exactly as specified.

1.3.3 Buy American Act (BAA) and Trade Agreement Act (TAA)

All products under the FF&E Option Item are subject to the rules and regulations governing the acquisition of foreign supplies, e.g., Buy American Act (BAA) (FAR 25.1 Buy American-Supplies). This also includes all supplies procured through Government Supply Sources. Solicitations are required to meet the Trade Agreement Act (TAA) Designated Countries (FAR 25.4 Trade Agreements), as part of the BAA. In addition to the applicable BAA clauses and provisions for construction materials, the Contracting Officer must also insert the appropriate BAA or TAA clauses and provisions for supplies. The Contractor is responsible for ensuring the FF&E is compliant with the BAA or TAA.

1.3.4 Prohibition on Procurement of Certain Items Containing Perfluorooctane Sulfonate (PFOS) or Perfluorooctanoic Acid (PFOA)

Effective April 1, 2023, in accordance with section 333 of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, the Department of Defense must not procure any covered items that contain PFOS or PFOA. The Contractor must not provide any covered items containing PFOS or PFOA in performance of this contract, task order, delivery order, or blanket purchase agreement order. A covered item means the following:

a. Nonstick cookware or cooking utensils for use in galleys or dining facilities.

b. Upholstered furniture, carpets, and rugs that have been treated with stain-resistant coatings.

1.3.5 Procurement and Installation

The Contractor must coordinate the building completion date with the installation dealer(s) specified in the FF&E Package. It is recommended that the Contractor order the products once the option is awarded to avoid incurring additional costs. Production and delivery dates should be requested of manufacturers or dealers at the time of order placement to coincide with the Beneficial Occupancy Date (BOD). The Contractor must anticipate possible manufacturer price increases if order placement is delayed. Any costs incurred due to manufacturer price increases as a result of order placement delays will be the burden of the Contractor.

1.3.6 Deposits

The Contractor must anticipate providing a deposit of between 30 percent and 50 percent of the product costs when placing the orders with the manufacturer's dealerships. The Government will not fund deposits.

1.3.7 Construction Wage Rate Requirements Statute

Prior to the Interior Designer sending out the Best Value Determination (BVD) Request for Quote (RFQ) Package to vendors, the NAVFAC Contracting Officer, Contract Specialist, Project Manager, Design Manager, NAVFAC Interior Designer and Collateral Equipment Manager must makea determination as to whether the FF&E and Specialty CEQ installation is covered by the Construction Wage Rate Requirements statute. The BVD RFQ Package must identify any items with installation that is subject to the Construction Wage Rate Requirements statute.

1.3.7.1 Construction Wage Rate Requirements Statute is Not Applicable

The Construction Wage Rate Requirements Statute is Not Applicable if the FF&E assembly and installation work is:

a. Segregable from the construction of the facility (i.e., procured in a separate FF&E Option (Item)); and

b. The assembly and installation work is performed by the FF&E vendor or dealer or subcontractor(s); and

c. The onsite FF&E work does not include a substantial amount of construction work; and

d. The workforce for the FF&E installation and delivery is separate and distinct from the labor workforce performing the construction effort by the Contractor.

If the above a. through d. are true, the Construction Wage Rate Requirements Statute is not applicable to FF&E installed by General Services Administration (GSA), other Government Supply Sources or Open Market.

1.3.7.2 Construction Wage Rate Requirements Statute is Applicable

The Construction Wage Rate Requirements Statute is Applicable if the FF&E assembly and installation work is:

a. Performed by the Contractor; and

b. Is not physically or functionally separate from the other construction work required by the contract; and

c. Is not capable of being performed on a segregated basis from the other construction work required by the contract.

-OR-

d. The assembly and installation work is performed by the FF&E vendor or dealer or subcontractor(s); and

e. The onsite FF&E work does include a substantial amount of construction work.

If the above a. through c. are true or d. through e. are true, the Construction Wage Rate Requirements statute would be applicable to the installation of all FF&E that is installed and attached to the facility.

1.3.8 Taxes

1.3.8.1 Exemptions

Exemptions for certain state or local taxes may be available to the Contractor and its subcontractors. The Contractor must take maximum advantage of all exemptions, including obtaining a resale permit from state and local taxation authorities whether available directly to the Contractor or based on an exemption afforded the Government. The responsibility for paying applicable taxes rests with the Contractor. Applicable state and local taxes to the FF&E Package must be included with the subcontractor's quote, if required by the state or locality.

1.3.8.2 Construction Contract Requirements

As prescribed in FAR 29.401-3 Federal, State, and local taxes, the Contracting Officer must insert FAR clause 52.229-3, Federal, State and Local Taxes, in the construction contract. In accordance with this clause:

a. The contract price includes all applicable Federal, State, and local taxes and duties; and

b. The Government must, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

1.3.9 Performance and Payment Bonds

1.3.9.1 No Bond Requirement for FF&E at Time of Construction Contract Award

FAR 28.102-1(a) requires that performance and payment bonds be included in all construction contracts exceeding the Simplified Acquisition Threshold (SAT), except under the conditions listed. Since the FF&E Option Item is not part of the original contract award, the Contractor is not required to secure bond for the FF&E at the time the basic construction contract is awarded.

1.3.9.2 Additional Bond at FF&E Option Item Award

FAR 28.102-2(d) requires the Government to secure additional bond from the Contractor for any contract price increases. An increase to the original contract bond is required at the time of the FF&E Option Item award to protect the Government against the Contractor not providing FF&E ordered and to ensure that the FF&E vendor(s) receive payment if the Contractor goes out of business. The increased cost of the Government required bond must come from the FF&E funding source and is not a part of the Contractor's HAR.

1.3.9.3 Bonds Required by the Contractor

If the Contractor requires bonding from the FF&E subcontractor(s), the cost must be covered in the Contractor's HAR.

1.3.10 Item Unique Identification (IUID) and Valuation

Item Unique Identification (IUID) and valuation is a system of marking and valuing items delivered to Department of Defense (DoD) that enhances logistics, contracting, and financial business transactions. Utilize the

IUID policy for all DoD contracts that require the delivery of items. An item is a single article or a single unit formed by a grouping of subassemblies, components or constituent parts. In accordance with DFARS 211.274-2 Policy for item unique identification, IUID is required for all delivered items for which the Government's unit acquisition cost is $5,000 or more. Items identified by the requiring activity to be serially managed, mission essential, controlled inventory or for other reasons requiring permanent identification, must be marked with a unique item identifier.

1.3.10.1 IUID

The two main steps involved in IUID requirements are:

a. Item marking, and

b. Delivery of data about items as a part of the acceptance and delivery process.

1.3.10.2 Data Matrix Requirements

Item marking requires that qualifying items contain a data matrix either directly inscribed on the individual item or on a permanent label or data plate attached to the item. Delivery of data is executed by submitting to the IUID Registry information such as: description of the item, its value, and the date of acceptance by the government. The IUID Registry is the repository established to capture and store all IUID data.

1.3.10.3 Government's Unit Acquisition Cost

In accordance with DFARS 211.274-3 Policy for valuation, Contractors must be required to identify the Government's unit acquisition cost for all items delivered even if none of the criteria for placing a unique item identification mark applies.

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 FF&E Pre-Installation Walk-Through

The Contractor must coordinate and participate in a walk-through to ensure that the building interior is substantially complete in all areas scheduled to receive FF&E to include floor, wall and ceiling finishes and building systems located on or in the ceilings. Attendees must include the FF&E vendor(s) in-person (if geographically feasible) or virtually and the NAVFAC Construction Manager. Approval by the NAVFAC Construction Manager to proceed with the FF&E installation is required. The walk-through date must occur prior to the commencement of the FF&E installation and accommodate sufficient time in the construction schedule for transportation of FF&E to the job site upon approval by the NAVFAC Construction Manager.

1.4.2 Sequencing

The Contractor must coordinate the building completion, occupancy, and furniture installation dates with the installation dealer(s) specified in the FF&E Package. Any costs associated with or delaying furniture shipments to accommodate the construction schedule is the responsibility of the Contractor.

1.5 SUBMITTALS

Government approval is required for all submittals.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The NAVFAC Interior Designer is required to receive a copy of all submittal.

SD-01 Preconstruction Submittals

FF&E Schedule and Schedule Updates

Contractor's Interior Designer's Qualifications

SD-04 Samples

Interior Finish Construction Submittals

Post Option Award FF&E Finish Submittals

SD-05 Design Data

FF&E Basis of Design Package

FF&E BVD Request for Quotation (RFQ) Package

BVD Package

Pre-Final FF&E Package "Over the Shoulder"

Pre-Final FF&E Package

Final FF&E Package

SD-10 Operation and Maintenance Data

Warranty and Maintenance Information

SD-11 Closeout Submittals

Punch List(s) Submittal

1.6 QUALITY CONTROL

1.6.1 Installation Qualifications

All FF&E must be installed by the manufacturer's dealer of record and not by the Contractor. In addition, installation dealer(s) must be located within a 100 mile radius of the project site unless approved by the NAVFAC Interior Designer.

1.7 DELIVERY, STORAGE, AND HANDLING

FF&E must be shipped to and stored at the vendor or dealer's conditioned warehouse, until all items are received unless dealer has coordinated just-in-time delivery with the Contractor. Vendor or dealer is responsible for any orders arriving before or after the agreed upon delivery and installation date with the Contractor, including storage of items.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 INTERIOR DESIGN SERVICES

Provide Interior Design FF&E services and deliverables in accordance with FC 1-300-09N, UFC 3-120-10, Interior Design Procedures: Furniture Fixtures and Equipment (FF&E) located at https://www.wbdg.org/ffc/navy-navfac/collateral-equipment/navfac-id-procedures-ffe and as further defined in the paragraphs below. Utilize NAVFAC templates, criteria and procedures documents located at https://www.wbdg.org/ffc/navy-navfac/collateral-equipment.

3.1.1 SYSTEM DESCRIPTION: CONTRACTOR'S INTERIOR DESIGN SERVICES

The FF&E or CEQ Concept Design Package submittal (approximately 35 percent), as prepared by the NAVFAC Interior Designer, was sufficiently developed to fully integrate with the building systems (e.g., electrical, mechanical) to include product sizes and communications, data, and electrical requirements. The Contractor must hire a different Interior Designer to validate the FF&E Concept Design Package requirements with the Activity or End User and NAVFAC Interior Designer and make any necessary revisions.

Provide and comply with Interior Design Procedures: Furniture Fixtures and Equipment (FF&E) CHAPTER(s) 1 through 4 and specific Design, Meeting and Submittal deliverables identified below and as defined for the Contractor's Interior Designer in CHAPTER 5 ID SERVICES - DESIGN BID BUILD (DBB) - PROCESS 1. The Contractor may not hire the A/E's Interior Designer who prepared the Concept Design Package submittal. All required effort by the Contractor's Interior Designer described above must be included in the Construction Base Price and is separate and excluded from the FF&E Option Item.

3.1.1.1 Contractor's Interior Designer's Qualifications

Provide the services of an Interior Designer. Qualification of Interior Designer is based on education, experience and examination. The Contractor's Interior Designer must have completed a program accredited by the Council for Interior Design Accreditation (CIDA) or equal accreditation program of academic training in Interior Design. For all Interior Design Services, the Interior Designer must have attained National Council for Interior Design Qualification (NCIDQ) certification and state licensure, certification or registration. In addition, the Contractor's Interior Designer must have experience as the primary Interior Designer on projects, to include NAVFAC projects, of similar type, size, scope and complexity to this contract project. Experience using GSA contracts is required. Writing non-proprietary, technical performance criteria and the evaluation of vendor proposals for competitive furniture and specialty equipment Best Value Determinations (BVDs) is required and must be clearly indicated in the resume. **The Contractor may not hire the A/E's Interior Designer or A/E's equipment specialist(s)**.

The Contractor, the Contractor's Interior Designer, Design Firm owners, and any Equipment Specialists must NOT have any affiliation or partnership with any furniture, fixture, and equipment products, manufacturers,

furniture or equipment vendor or dealerships used on this project in order to avoid any organizational conflict of interest. Additionally, the Prime Contractor is required to use the services of an Interior Designer other than the A/E's Interior Designer who developed the Concept FF&E Package. For the Contractor's Interior Designer's Qualifications submittal, provide a detailed resume, client references and documentation of the Contractor's Interior Designer's qualifications and significant interior design experience to the NAVFAC Contracting Officer and Interior Designer for approval PRIOR to the Pre-Construction Conference (PRECON). The Government will approve or disapprove the Contractor's Interior Designer based on the provided documentation and past performance.

3.1.1.2 Concept FF&E Package

The FF&E or CEQ Concept Package indicating the salient characteristics for all required FF&E items and Computer Aided Design and Drafting (CADD)/BIM drawings, will be provided by the NAVFAC Contracting Officer upon request. The Contractor must request to receive the package prior to the PRECON.

3.1.1.3 FF&E Schedule and Schedule Updates Submittal

For all projects, including fast track projects and renovations, the Contractor is responsible for sufficiently scheduling all FF&E meetings and deliverables early enough to:

a. Obtain the required government approvals,

b. Meet all FF&E funding, award, ordering and installation lead times and deadlines, and

c. Complete the FF&E installation by the Beneficial Occupancy Date (BOD).

All submittal due dates for the FF&E and any Specialty CEQ must be noted in the FF&E Schedule and Schedule Updates Submittal and reflected in the Contractor's construction schedule. Provide a FF&E Schedule and Schedule Updates Submittal for all FF&E and Specialty CEQ services and deliverables to the NAVFAC Construction Manager, Interior Designer and Contracting Officer seven business days after the Interior Design Orientation Meeting. Submit FF&E Schedule and Schedule Updates Submittal to the NAVFAC Interior Designer within seven days of any construction schedule revisions.

All submittal due dates for the FF&E and specialty equipment must be reflected in the Contractor's construction schedule. Submit proposed changes to the NAVFAC Interior Designer for review. The Contracting Officer must approve all revisions or deviations.

3.1.1.4 Services

The Contractor's Interior Designer and any Equipment Specialists are responsible for developing Final FF&E and Specialty CEQ Packages required in the project.

3.1.1.4.1 Validation of Requirements

The Contractor's Interior Designer and Equipment Specialist(s) must meet with the Activity at the PRECON to discuss the function of each area, validate all FF&E or CEQ requirements, make any necessary changes and additions to the Concept FF&E Package and recommend any adjustments or

revisions to the interior building finishes and building infrastructure.

3.1.1.4.2 Building Infrastructure and Systems

The Contractor's Interior Designer is responsible for ordering samples of all interior building finishes required for coordination. The FF&E and CEQ Package(s) must be fully integrated with the design, construction, and schedule of all building finishes and all building infrastructure and systems (such as heating, ventilation and air conditioning (HVAC), plumbing, fire protection, communications, electrical, data, architecture). All electrical, data and communications outlets, switches, fire extinguishers, thermostats, sprinkler heads and Architectural Barriers Act (ABA) clearances must be accommodated for and be fully accessible once equipment is installed. The Contractor's Interior Designer and Equipment Specialist(s) must work with the Contractor and the electrical, telecommunication, and mechanical subcontractors to coordinate all infrastructure with the recommended vendors to include connection of power, data, communications, waterlines and gas lines, and calibration, testing and training prior to facility turnover and operation.

Provide coordination with the building infrastructure and provide revisions to the building infrastructure if required to support the FF&E Package and Specialty CEQ Package. Provide dimensioned locations on plans and elevations for multi-user telecommunications outlet assemblies (MUTOAs), junction boxes, wall outlets and floor boxes based on sizes, layouts and configurations of the equipment items in the FF&E Package and any Specialty CEQ Package.

3.1.1.4.3 Government-Furnished, Government Installed Equipment (GFGI) and Government-Furnished, Contractor-Installed Equipment (GFCI)

The FF&E and CEQ plans included in each submittal must take into consideration all FF&E or CEQ to include specialty CEQ, existing and future Government-Furnished, Government Installed (GFGI) Equipment and Government-Furnished, Contractor-Installed Equipment (GFCI). These items may include, but are not limited to, multi-function devices, printers, shredders, safes and vending machines.

3.1.1.4.4 Inventory of Existing FF&E or CEQ

The Contractor's Interior Designer is responsible for creating an inventory of existing FF&E or CEQ to be relocated to the new or renovated facility and incorporating both new and existing FF&E or CEQ into the FF&E plans.

The Activity will supply the Contractor's Interior Designer with a complete list of all existing FF&E or CEQ, to include e.g., sizes, utility requirements and weight, to be relocated or used in the new or renovated facility. The Contractor's Interior Designer is responsible for incorporating this equipment into the FF&E plan.

3.1.2 FF&E MEETINGS, PRESENTATIONS AND SUBMITTALS FOR THE INTERIOR DESIGN SERVICES

The Contractor's Interior Designer must attend all design meetings, site visits, walk-throughs, coordinate required mock-ups, obtain Activity and NAVFAC approvals and provide a complete and functional FF&E Package. All meetings must be coordinated with advance notice to the FF&E vendor(s), and NAVFAC Interior Designer, so that schedule and travel can be coordinated.

Each submittal must demonstrate thorough interaction with the Activity's functional requirements and complete coordination with the facility design and the Structural Interior Design (SID).

These are minimum requirements and the Contractor must be prepared to provide all additional meetings and submittals that may be necessary to support the Interior Design effort and FF&E coordination. Submit any revisions or deviations caused by discontinued items or NAVFAC required changes to the NAVFAC Interior Designer for review. The Contracting Officer must approve all revisions and deviations.

3.1.2.1 Interior Design Orientation Meeting

The Interior Design Orientation Meeting must occur at NAVFAC MIDLANT, or virtually. This meeting must occur within seven days of PRECON meeting. This meeting must include a validation of FF&E requirements with the Activity and a walk-through of the Activity's existing facility(s) or similar facility. Submit minutes of this meeting to the NAVFAC Interior Designer within seven business days of this meeting and include the preliminary schedule for the FF&E Meetings and Submittals.

3.1.2.2 "Over the Shoulder" Review Meeting of the FF&E Basis of Design Package Submittal

3.1.2.2.1 "Over the Shoulder" Review Meeting

The "Over the Shoulder" Review Meeting will be heldat NAVFAC MIDLANT_. If the meeting is held virtually, submit one hard copy and one digital copy of the presentation to the NAVFAC Interior Designer prior to the meeting.

The Contractor's Interior Designer must present the FF&E Basis of Design Package Submittal to the NAVFAC Interior Designer prior to presenting to the Activity. The submittal may be presented in a "loose" format or binder for NAVFAC approval prior to the Activity presentation. No presentation boards are required.

3.1.2.2.2 FF&E Basis of Design Package Submittal

Provide FF&E Basis of Design Package Submittal in accordance with Interior Design Procedures: Furniture, Fixtures and Equipment (FF&E).

3.1.2.3 FF&E Basis of Design Package Submittal Presentation to the Activity

This FF&E Basis of Design Presentation will be held at the Activity's location at Cherry Point, NC. After implementing all feedback from the NAVFAC Interior Designer, the Contractor's Interior Designer must present the FF&E Basis of Design Package Submittal to the Activity for feedback and approval. This meeting must include a walk-through of the Activity's existing facility(s) or similar facility. Minutes of this meeting with photos of the approved FF&E product must be submitted to the NAVFAC Interior Designer within seven business days.

During this meeting, a detailed, functional review of the entire project must occur, with the FF&E presentation to follow, to ensure that all current FF&E requirements have been validated and captured. The submittal may be presented to the Activity in a "loose" format or binder. No presentation boards are required.

3.1.2.4 "Over the Shoulder" Review Meeting of the BVD Request for Quotation (RFQ) Package Submittal

Meet with the NAVFAC ID for an "over-the-shoulder" review meeting. Hold meeting at NAVFAC MIDLANT.

3.1.2.5 FF&E BVD Request for Quotation (RFQ) Package Submittal

Provide FF&E BVD Request for Quotation (RFQ) Package Submittal in accordance with Interior Design Procedures: Furniture, Fixtures and Equipment (FF&E).

3.1.2.6 BVD Package Submittal and "Over the Shoulder" Review Meeting

The Contractor's Interior Designer must schedule an "Over the Shoulder" virtual meeting to review the results of the responses to each FF&E BVD RFQ Package and discuss the best value vendor recommendation(s). If clarifications, updates or revisions are required, documentation must be revised and resubmitted. The Contractor's Interior Designer must submit one book-marked PDF copy of this submittal to the NAVFAC Interior Designer. Book-marked PDF copies must also be sent to the NAVFAC Construction Manager, Asset Management Branch (AMD) or Supply Management Division (SMD) (USMC projects), and the NAVFAC Contracting Officer.

3.1.2.7 Vendor Recommendation Letter and De-Briefs

Following the approval of the vendor recommendation, the Contractor's Interior Designer must send out notification to the vendors that submitted pricing proposals. A template for the notification letter will be provided by the NAVFAC Interior Designer. If a de-brief is requested by a vendor, the Contractor's Interior Designer must not reveal any pricing or proprietary information from other vendors in the de-brief.

3.1.2.8 Pre-Final FF&E Package "Over the Shoulder" Submittal Review Meeting

The meeting is to occur at NAVFAC MIDLANT, located in Cherry Point,NC. The Contractor's Interior Designer must present the Pre-Final FF&E Package "Over the Shoulder" Submittal for NAVFAC and Activity approval. The submittal may be presented in a "loose" format or binder. No presentation boards required.

3.1.2.9 Pre-Final FF&E Package Submittal

Provide the following number of Pre-Final FF&E Package Submittals; Two binder copies and four electronic copies total, as follows:

a. One binder copy and one electronic copy for the NAVFAC Interior Designer

b. One binder copy and one electronic copy for the Activity

c. One electronic copy for the Facilities Engineering and Acquisition Division (FEAD) or Resident Officer in Charge of Construction (ROICC)

d. One electronic copy for the NAVFAC Project Manager

3.1.2.10 Final FF&E Package Submittal

Provide the Final FF&E Package Submittal 9 months prior to BOD, following

the receipt of review comments on the Pre-Final FF&E Package Submittal and as determined by the approved FF&E schedule developed and incorporated into the Contractor's Schedule.

Submit the Final FF&E Submittal in a 3-ring binder for review and approval. Provide the following number of Final FF&E submittals; Three binder copies and four electronic copies, as follows:

a. One binder copy and one electronic copy for the NAVFAC Interior Designer

b. One binder copy and one electronic copy for the Facilities Engineering and Acquisition Division (FEAD) or Resident Officer in Charge of Construction (ROICC)

c. One binder copy and one electronic copy for the Activity

d. One electronic copy for the NAVFAC Project Manager

3.1.2.11 Interior Finish Construction Submittals

Some building interior finishes (Structural Interior Design) may need to be revised to coordinate with the Final FF&E Package. Submit any revisions or deviations to the building interior finishes to the NAVFAC Interior Designer for review. The Contracting Officer must approve any changes to the building interior finishes.

3.2 POST-AWARD FF&E OPTION ITEM CHANGES

3.2.1 Requests for Price Changes

The FF&E Option has been priced, negotiated, and awarded based on specific line items as detailed in the approved Final FF&E Submittal. These items have been approved considering color, specific type and quality of material, price, and usable life. The Government will expect and require the Contractor to provide exactly those items. Any requests to change FF&E items that will cause a price change must be submitted in writing for approval by the NAVFAC Contracting Officer and Interior Designer before purchase and installation.

3.2.2 Requests for Item Changes

Should changes become necessary, careful consideration is required to ensure that equivalent quality, price and other aspects of the items are maintained. Any adjustments must be negotiated. Provide BVD documentation for each substituted item if the extended cost for the item exceeds the micro-purchase threshold (MPT). If multiple items from the same SIN must be substituted, include in the same BVD. Unexpired vendor quotes from the original FF&E RFQ may be used in the new BVD, provided that they are the same SIN and all quotes are from the same procurement category, i.e., GSA or Open Market. The Contractor must coordinate with the NAVFAC Interior Designer and Collateral Equipment Manager, in consultation with the Activity, for any changes to the FF&E. The Contracting Officer must approve any changes.

3.2.3 Post Option Award FF&E Finish Submittals

FF&E finishes may need to be revised due to discontinued product finishes. Submit any revisions or deviations to the FF&E finishes to the

NAVFAC Interior Designer for review. The Contracting Officer must approve any changes to the FF&E finishes.

3.2.4 Validation of Pricing

The Contractor must validate pricing with the FF&E vendor(s) prior to FF&E Option award. Cost increases due to authorized GSA schedule price increases must be allowed prior to the FF&E Option award to purchase the FF&E. Reimbursement for price increases after FF&E Option award will not be considered.

3.2.5 Progress Payments

Per FAR 52.232-5 Payments under Fixed-Price Construction Contracts, the Contracting Officer may authorize a progress payment on the FF&E ordered as material delivered to the Contractor, at locations other than the site if:

a. Consideration is specifically authorized by this contract; and

b. The Contractor furnishes satisfactory evidence, including a copy of the order acknowledgment and proof of payment, that it has acquired title to such material, the material is stored in a secure, climate controlled location, and that the material will be used to perform this contract.

3.3 INSTALLATION

The FF&E Package includes the installation of all furniture and furnishings as specified in the Final FF&E Package. The FF&E installation dealer(s) specified in the FF&E Package must receive, store as required, transport to the project site, off load, inside deliver, unpack, assemble, install, clean, and dispose of all the trash for all FF&E. It is the Contractor's responsibility to coordinate the building completion, occupancy, and furniture installation dates with the installation dealer(s) specified in the FF&E Package. Any costs associated with or delaying furniture shipments to accommodate the construction schedule is the responsibility of the Contractor.

3.3.1 FF&E Pre-Installation Walk-Through

The Contractor must coordinate and participate in a walk-through to ensure that the building interior is substantially complete in all areas scheduled to receive FF&E to include floor, wall and ceiling finishes and building systems located on or in the ceilings. Attendees must include the NAVFAC Construction Manager and the FF&E vendor(s) in-person (if geographically feasible) or virtually. Approval by the NAVFAC Construction Manager to proceed with the FF&E installation is required. The walk-through date must occur prior to the commencement of the FF&E installation and accommodate sufficient time in the construction schedule for transportation of FF&E to the job site upon approval by the NAVFAC Construction Manager.

3.3.2 Walk Through(s) and Punch List(s) Submittal

The Contractor, Contractor's Interior Designer, NAVFAC Interior Designer, FF&E vendor(s) or dealer(s) representative and installation superintendent, other specialty consultants (if applicable), NAVFAC Construction Manager, and the Activity will attend one punch list site

visits. The site visit must be held at the installation dealer's 98 percent completion and must identify and record all punch list items in the Punch List(s) Submittal.

The Contractor must repair, to the Government's satisfaction, all damage to any facility finish that is a result of the furniture installation and correct all punch list items for the FF&E. Any damage or loss of FF&E after installation will be the responsibility of the Contractor and not the FF&E vendor or installer. Daily installation walk-throughs by the Contractor and the FF&E installation dealer are encouraged to document any damage and identify the responsible party(s).

3.4 INSTALLATION WARRANTY

Install all movable furnishings in accordance with the manufacturer's instructions and warranty requirements. All movable furnishings must be level and aligned. All doors, drawers and accessories must be level and aligned to open, close and otherwise operate smoothly and securely.

All FF&E and Specialty CEQ must be installed by the manufacturer's dealer of record and not by the Contractor.

3.5 CLOSEOUT SUBMITTALS

3.5.1 Warranty And Maintenance Information

Provide to the Contracting Officer at the final FF&E walk-thru one electronic copy and one binder copy of all ordering documentation, including but not limited to, quotes, purchase orders, factory order numbers (FO), IUID, and warranty and maintenance information for all products.

-- End of Section --

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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	(2020) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.3	(2021) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2021) Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.21	(2021) Nonmetallic Flat Gaskets for Pipe Flanges

ASTM INTERNATIONAL (ASTM)

ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A135/A135M	(2021) Standard Specification for Electric-Resistance-Welded Steel Pipe
ASTM A153/A153M	(2023) 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

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2022; TIA 23-4) Standard for the Installation of Sprinkler Systems
NFPA 24	(2022) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 291	(2022) Recommended Practice for Fire Flow Testing and Marking of Hydrants

UL SOLUTIONS (UL)

UL 199	(2020) UL Standard for Safety Automatic Sprinklers for Fire-Protection Service
UL Fire Prot Dir	UL Product IQ (updated online) at https://productiq.ulpropsector.com/en

1.2 SYSTEM DESCRIPTION

Modify the existing wet pipe sprinkler system(s) in areas indicated on the drawings. Except as modified herein, the system must meet the requirements of NFPA 13 Pipe sizes which are not indicated on the Contract drawings must be determined by hydraulic calculations.

1.2.1 Hydraulic Design

1.2.1.1 Basis for Calculations

A waterflow test was performed on November 14, 2023 at B3918 and resulted in a static pressure of 54 psi with a residual pressure of 48 psi while flowing 1130 gpm. Perform a fire hydrant flow test prior to shop drawing submittal in accordance with NFPA 291. Results must include hydrant elevations relative to the building and hydrant number/identifiers for the tested hydrants, including which were flowed, which had a gauge. This information must be presented in a tabular form if multiple hydrants were flowed. The results must be included with the hydraulic calculations. Hydraulic calculations must be based on flow test noted in this paragraph, unless verified by the NAVFAC MIDLANT Fire Protection Engineer and approved by Contracting Officer. Hydraulic calculations must be based upon the Hazen-Williams formula with a "C" value noted in NFPA 13 for piping . .

1.2.1.2 Hydraulic Calculations

a. Water supply curves and system requirements must be plotted on semi-logarithmic graph (N^1.85) paper so as to present a summary of the complete hydraulic calculation.

b. Provide a summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, minimum discharge pressures and minimum flows. Elevations of hydraulic reference points (nodes) must be indicated.

c. Documentation must identify each pipe individually and the nodes connected thereto. Indicate the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient for each pipe.

d. Where the sprinkler system is supplied by interconnected risers, the sprinkler system must be hydraulically calculated using the hydraulically most demanding single riser. The calculations must not assume the simultaneous use of more than one riser.

e. All calculations must be performed back to the actual location of the flow test, taking into account the direction of flow in the service main at the test location.

f. For gridded systems, calculations must show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. A flow diagram indicating the quantity and direction of flows must be included.

1.2.1.3 Design Criteria

Hydraulically design the system to discharge a minimum density as indicated on the drawings. Hydraulic calculations must be in accordance with the Area/Density Method of NFPA 13. Add an allowance for exterior hose streams as indicated on the drawings to the sprinkler system demand at the fire hydrant shown on the drawings closest to the point where the water service enters the building

1.2.2 Sprinkler Coverage

Sprinklers must be uniformly spaced on branch lines. 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:

1.2.3 Qualified Fire Protection Engineer (QFPE)

The QFPE in this section is the same as FPQC in Section 01 45 00. Wherever “Qualified Fire Protection Engineer (QFPE)” or “QFPE” appears in this section, substitute with “Fire Protection Qualify Control Specialist (FPQC)”. 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. 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-05 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 all submittals. 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);

Sprinkler System Designer;

Sprinkler System Installer;

SD-02 Shop Drawings

Shop Drawing;

SD-03 Product Data

Pipe;

Fittings;

Relief Valves;

Sprinklers ;

Pipe Hangers and Supports ;

Air Vent;

Nameplates;

SD-05 Design Data

Hydraulic Calculations;

SD-06 Test Reports

Test Procedures;

SD-07 Certificates

Verification of Compliant Installation;

Request for Government Final Test;

SD-10 Operation and Maintenance Data

Operating and Maintenance (O&M) Instructions;

Spare Parts Data;

SD-11 Closeout Submittals

As-built drawings

1.4 QUALITY ASSURANCE

1.4.1 Preconstruction Submittals

Within 36 days of contract award 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

One Copy 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:

a. A descriptive index with drawings listed in sequence by number. A legend sheet identifying device symbols, nomenclature, and conventions used in the package.

b. Floor plans drawn to a scale not less than 1/8-inch equals 1-foot clearly showing locations of devices, equipment, risers, and other details required to clearly describe the proposed arrangement.

c. 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.

d. 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.

e. Plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance.

f. Riser layout drawings drawn to a scale of not less than 1/2-inch equals 1-foot to show details of each system component, clearances between each other and from other equipment and construction in the room.

g. Details of each type of riser assembly, pipe hanger, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring. The dimension from the edge of vertical piping to the nearest adjacent wall(s) must be indicated on the drawings when vertical piping is located in stairs or other portions of the means of egress.

h. Details of each type of pipe hangerand related components.

i. Include fire pump curve with shop drawings and hydraulic calculations.

1.4.1.2 Product Data

One copy 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 Hydraulic Calculations

Calculations must be as outlined in NFPA 13 except that calculations must be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings.

1.4.1.4 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. Each service organization submitted must be capable of providing 4-hour on-site response to a service call on an emergency basis.

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.

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. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "must" had been substituted for "should" wherever it appears. Interpret reference to "authority having jurisdiction" and/or AHJ to mean the NAVFAC Designated Fire Protection Engineer (DFPE).

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 least2 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 175

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 or ASTM A153/A153M.

Steel pipe must be minimum Schedule 40 for sizes 2 inches and less; and minimum Schedule 10 for sizes larger than 2 inches. Steel piping with wall thickness less than Schedule 40 must not be threaded.

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 ductile-iron conforming to ASTM A536. 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. Reducing couplings are not permitted except as allowed by NFPA 13.

2.2.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings must be designed for not less than 175 psi 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 2 inches 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, 1/16-inch 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 hangers and supports in accordance with NFPA 13.

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-factoras indicated on the drawings. Pendent sprinklers must have a polished chrome 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 as indicated on the drawings.

2.3.3 Sidewall Sprinkler

Sidewall sprinkler must be the quick-response dry sidewall type. Sidewall sprinkler must have a nominal K-factor as indicated on the drawings.

2.3.4 Concealed Sprinkler

Concealed sprinkler must be chrome-plated quick-response type and have a nominal K-factor as indicated on the drawings. Coverplate must be white.

2.3.5 Dry Sprinkler Assembly

Dry sprinkler assembly must be of thependent or sidewall type. Assembly must include an integral escutcheon. Maximum length must not exceed maximum indicated in its listing. Sprinkler must have a polished chrome finish.

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 3/4-inch 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 7 feet of the floor.

2.4.5 Relief Valve

Relief valves must be listed and installed at the riser in accordance with NFPA 13.

2.4.6 Air Vent

Air vents must be of the automatic type and piped to drain to the building exterior.

2.4.7 Identification Sign

Valve identification sign must be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gage steel or 0.024-inch 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 not 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 1-inch 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 (plus or minus 2 inches).e. Dry pendent sprinkler assemblies must be such that sprinkler ceiling plates or escutcheons are of the uniform depth throughout the finished space.

f. Dry pendent sprinklers must be of the required length to permit the sprinkler to be threaded directly into a branch line tee.

g. Where the maximum static or flowing pressure, whichever is greater at the sprinkler, applied other than through the fire department connection, exceeds 100 psi and a branch line above the ceiling supplies sprinklers in a pendent position below the ceiling, the cumulative horizontal length of an unsupported armover to a sprinkler or sprinkler drop must not exceed 12 inches for steel pipe and 6 inches for copper tube.

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. For copper tubing, pipe and groove dimensions must comply with the tolerances specified by the coupling 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 1/2-inch.

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 00.00 22 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 Drains

b. Auxiliary drains must be provided as required by NFPA 13. Auxiliary drains are permitted to discharge to a floor drain if the drain is sized to accommodate full flow (min 40 gpm). Discharge to service sinks or similar plumbing fixtures is not permitted.

3.3.11 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 4-inch and larger provide white painted stenciled letters and arrows, a minimum of 2 inches in height and visible from at least two sides when viewed from the floor. For pipe sizes less than 4-inch, provide white painted stenciled letters and arrows, a minimum of 0.75-inch 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 as specified in 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 Sprinkler Technician, and the representative of the installing company, 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

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). 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 fire alarm reporting 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 Engineer, 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 Aboveground Piping

3.7.1.1 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.

3.8 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.

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.

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE
05/24, CHG 1: 11/24

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 Z21.22/CSA 4.4	(2015; R 2020) Relief Valves for Hot Water Supply Systems

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

ANSI/ASHRAE 18	(2008; R 2013) Methods Of Testing For Rating Drinking Water Coolers With Self-Contained Mechanical Refrigeration

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A112.1.2	(2012; R 2017; R 2022) Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)
ASME A112.6.1M	(1997; R 2017) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3	(2022) Floor Drains
ASME A112.19.2/CSA B45.1	(2024) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
ASME A112.19.3/CSA B45.4	(2022) Stainless Steel Plumbing Fixtures
ASME A112.36.2M	(2022) Cleanouts
ASME B1.20.1	(2013; R 2018) Pipe Threads, General Purpose (Inch)
ASME B16.15	(2024) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2021) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(2021) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.50	(2021) Wrought Copper and Copper Alloy

	Braze-Joint Pressure Fittings
ASME B31.1	(2024) Power Piping
ASME B31.5	(2022) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2022) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IV	(2017) BPVC Section IV-Rules for Construction of Heating Boilers

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1001	(2021) Performance Requirements for Atmospheric Type Vacuum Breakers
ASSE 1003	(2020) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)
ASSE 1010	(2021) Performance Requirements for Water Hammer Arresters
ASSE 1011	(2017) Performance Requirements for Hose Connection Vacuum Breakers
ASSE 1012	(2023) Performance Requirements for Backflow Preventer with an Intermediate Atmospheric Vent
ASSE 1013	(2021) Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies
ASSE 1016	(2017) Performance Requirements for Automatic Compensating Valves for individual Showers and Tub/Shower Combinations
ASSE 1017	(2023) Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems - (ANSI approved 2010)
ASSE 1018	(2023) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002
ASSE 1020	(2020) Performance Requirements for Pressure Vacuum Breaker Assemblies
ASSE 1037	(2015; R 2020) Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures
ASSE 1044	(2023) Performance Requirements for Trap

	Seal Primer - Drainage Types and Electric Design Types
ASSE 1070	(2020) Performance Requirements for Water Temperature Limiting Devices
ASSE 1072	(2020) Performance Requirements for Barrier Type Trap Seal Protection for Floor Drains

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084	(2017) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(2024) Hypochlorites
AWWA B301	(2024) Liquid Chlorine
AWWA C203	(2020) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C651	(2023) Standard for Disinfecting Water Mains
AWWA C652	(2019) Disinfection of Water-Storage Facilities
AWWA C700	(2020) Cold-Water Meters - Displacement Type, Metal Alloy Main Case
AWWA C701	(2019) Cold-Water Meters - Turbine Type for Customer Service

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2019) Specification for Filler Metals for Brazing and Braze Welding
AWS B2.2/B2.2M	(2016) Specification for Brazing Procedure and Performance Qualification

ASTM INTERNATIONAL (ASTM)

ASTM A733	(2016; R 2022) Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B88	(2022) Standard Specification for Seamless Copper Water Tube
ASTM B88M	(2020) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM B370	(2022) Standard Specification for Copper

	Sheet and Strip for Building Construction
ASTM B813	(2024) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B828	(2023) Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
ASTM C564	(2020a) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2018; R 2024) Standard Specification for Elastomeric Joint Sealants
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D1004	(2013) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D2564	(2020) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2665	(2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2855	(2020) Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
ASTM D3122	(1995; R 2009) Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings
ASTM D3139	(2019) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	(2020) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3311	(2017) Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM D4551	(2017) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane
ASTM D4586/D4586M	(2007; R 2018) Asphalt Roof Cement,

	Asbestos-Free
ASTM E1	(2014) Standard Specification for ASTM Liquid-in-Glass Thermometers
ASTM E96/E96M	(2024) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM F409	(2022) Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings
ASTM F477	(2014; R 2021) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F891	(2024) Standard Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core
ASTM F1760	(2016; R 2020) Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA A4015	(2016; 14/17) Copper Tube Handbook

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities
ICC IPC	(2024) International Plumbing Code

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-80	(2019) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA MG 1	(2021) Motors and Generators
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2024) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF 372	(2022) Drinking Water System Components - Lead Content
NSF/ANSI 14	(2023) Plastics Piping System Components and Related Materials
NSF/ANSI/CAN 61	(2024) Drinking Water System Components - Health Effects

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA Fire Man	(2016) Firestopping: Plastic Pipe in Fire Resistive Construction

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI WH 201	(2010) Water Hammer Arresters Standard

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1508	(2023) Hose Clamp Specifications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

PL 93-523	(1974; A 1999) Safe Drinking Water Act

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 430	Energy Conservation Program for Consumer Products
40 CFR 141.80	National Primary Drinking Water Regulations; Control of Lead and Copper; General Requirements

UL SOLUTIONS (UL)

UL 174	(2004; Reprint Nov 2024) UL Standard for Safety Household Electric Storage Tank Water Heaters
UL 399	(2017; Reprint May 2019) UL Standard for Safety Drinking Water Coolers
UL 1951	(2011; Reprint Jun 2020) UL Standard for Safety Electric Plumbing Accessories

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plumbing System;

SD-03 Product Data

Backflow Prevention Assemblies

Fixtures

Shower Faucets

Flush Valve Water Closets

Countertop Lavatories

Kitchen Sinks

Water Heaters

Pumps

Vibration-Absorbing Features;

Thermostatic Mixing Valves

Temperature Controlled Mixing Valve

Point-Of-Use Mixing Valve

Automatic Temperature And Pressure Compensating Valve

SD-06 Test Reports

Tests, Flushing and Disinfection

Test of Backflow Prevention Assemblies

1.3 STANDARD PRODUCTS

Specified equipment must essentially duplicate equipment that has performed satisfactorily at least 2 years prior to bid opening. Standard products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use 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.

1.3.1 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 manufacturer's factory or laboratory tests, can be shown.

1.3.2 Service Support

The equipment items must 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 must 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 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.

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, "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.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions must be considered mandatory, the word "should" must be interpreted as "must." Reference to the "code official" must be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" must be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" must be interpreted to mean the "lessor." References to the "permit holder" must 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, must 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 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work must be in accordance with ICC IPC.

1.6 PROJECT/SITE CONDITIONS

The Contractor must become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any

discrepancy before performing any work.

1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

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 must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work. Submit Plumbing System Operation and Maintenance Data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Instruction must 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 must 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.

1.8 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 must be in accordance with TABLES I and II. Pipe schedules must be selected based on service requirements. Pipe fittings must be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement must meet NSF/ANSI 14 and must be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service must bear the NSF seal "NSF-PW." Material or used in any potable water system intended for human consumption be certified in accordance with NSF 372 with the exception of brazing materials. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers must comply with PL 93-523 and NSF/ANSI/CAN 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/CAN 61, Section 9. Plastic pipe must not be installed in air plenums. Plastic pipe must not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.1.1 Pipe Joint Materials

Solder containing lead must not be used with copper pipe. Joints and gasket materials must conform to the following:

a. Brazing Material: Brazing material must conform to AWS A5.8/A5.8M, BCuP-5.

b. Brazing Flux: Flux must be in paste or liquid form appropriate for use with brazing material. Flux must be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.

c. Solder Material: Solder metal must conform to ASTM B32.

d. Solder Flux: Flux must be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.

e. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.

f. Flexible Elastomeric Seals: ASTM D3139, ASTM D3212 or ASTM F477.

g. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D2564 and ASTM D2855.

h. Plastic Solvent Cement for Styrene Rubber Plastic Pipe: ASTM D3122.

i. Copper tubing must conform to ASTM B88, Type K, L or M.

2.1.2 Miscellaneous Materials

Miscellaneous materials must conform to the following:

a. Water Hammer Arrester: PDI WH 201. Water hammer arrester must be diaphragm or piston type.

b. Copper, Sheet and Strip for Building Construction: ASTM B370.

c. Asphalt Roof Cement: ASTM D4586/D4586M.

d. Hose Clamps: SAE J1508.

e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.

f. Metallic Cleanouts: ASME A112.36.2M.

g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material must be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.

h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.

i. Hypochlorites: AWWA B300.

j. Liquid Chlorine: AWWA B301.

k. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.100.

l. Thermometers: ASTM E1. Mercury must not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation must 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 must conform to MSS SP-58.

2.3 VALVES

Valves must be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller must be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger must have flanged iron bodies and bronze trim. Pressure ratings must be based upon the application. " Valves must conform to the following standards:

Description	Standard
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Water Pressure Reducing Valves	ASSE 1003
Water Heater Drain Valves	ASME BPVC SEC IV, Part HLW-810: Requirements for Potable-Water Heaters Bottom Drain Valve
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22/CSA 4.4

2.3.1 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer must be brass with 3/4 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle must be securely attached to stem.

2.3.2 Relief Valves

Water heaters and hot water storage tanks must have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve must 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 must have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves must be rated according to ANSI Z21.22/CSA 4.4. Relief valves for systems where the maximum rate of heat input is less than 200,000 Btuh must have 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where

the maximum rate of heat input is greater than 200,000 Btuh must have 1 inch minimum inlets, and 1 inch outlets. The discharge pipe from the relief valve must be the size of the valve outlet.

2.3.3 Thermostatic Mixing Valves

Each valve must 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 must be of an approved type. The body must be of heavy cast bronze, and interior parts must be brass, bronze, corrosion-resisting steel or copper. The valve must be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets.

2.3.4 Temperature Controlled Mixing Valve

Provide an ASSE 1017 temperature controlled (master mixing valve) to lower temperature per UFC 3-420-01 immediately downstream of the water heater or storage tank as close to the fixture(s) as possible in order to reduce the amount of stored tempered water in the pipes in accordance with ASSE 1017.

2.3.5 Point-of-Use Mixing Valve

Provide a point-of-use mixing valve in accordance with ASSE 1070 at lavatories, hand-wash sinks, and washfountain locations. Point-of-use mixing valve must limit the tempered water to not greater than 110 degrees F.

2.3.6 Automatic Temperature and Pressure Compensating Valve

Provide automatic temperature and/or pressure compensating valve installed at each individual shower in accordance with ASSE 1016. The compensating valve must be integrated with each individual shower valve and must be installed at point of use. The valve must be equipped with a device to limit the maximum temperature to 120 degrees F.

2.4 FIXTURES

Submit list of fixtures with manufacturer, model, and flow rate. Water closet replacements in major renovations may have a flush valve of up to 1.6 GPF to accommodate existing plumbing capacity. Fixtures for use by the physically handicapped must be in accordance with ICC A117.1. Vitreous China, nonabsorbent, hard-burned, and vitrified throughout the body must be provided. Porcelain enameled ware must 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 must 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, must be equipped with a trap. Brass expansion or toggle bolts capped with acorn nuts must be provided for supports, and polished chromium-plated pipe, valves, and fittings must be provided where exposed to view. Fixtures with the supply discharge below the rim must 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 must be copper alloy with all visible surfaces chrome plated. Plastic in contact with hot water must be suitable for 180 degrees F water temperature.

2.4.1 Automatic Controls

Provide hard wired automatic, sensor operated faucets and flush valves to comply with ASSE 1037 and UL 1951 for lavatory faucets, urinals, and water closets. Flushing and faucet systems must consist of solenoid-activated valves with light beam sensors. Flush valve for water closet must include an override pushbutton. Flushing devices must be provided as described in paragraph FIXTURES AND FIXTURE TRIMMINGS.

2.4.2 Flush Valve Water Closets

2.4.2.1 Flush Valve Water Closet Type and Mount

ASME A112.19.2/CSA B45.1, white vitreous china, siphon jet, elongated bowl, floor-mounted, floor outlet. Top of toilet seat height above floor must be 14 to 15 inches, except 17 to 19 inches for wheelchair water closets. Provide wax bowl ring including plastic sleeve. Provide white solid plastic elongated.

2.4.2.2 Flush Valve Water Closet Flush and Flow

Water flushing volume of the water closet and flush valve combination must not exceed 1.28 gallons per flush. Water closets must meet the EPA WaterSense product definition and must be EPA WaterSense labeled products.

2.4.2.3 Flush Valve Water Closet Control Valve

Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components must be chromium-plated or polished stainless steel. Flush valves must be nonhold-open type. Mount flush valves not less than 11 inches above the fixture. Mounted height of flush valve must not interfere with the hand rail in ADA stalls. Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid.

2.4.3 Countertop Lavatories

ASME A112.19.2/CSA B45.1, under-counter mount vitreous china,, minimum dimensions of 19 inches wide by 17 inches 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. Mount counter with the top surface 34 inches above floor and with 29 inches minimum clearance from bottom of the counter face to floor. Provide top-mounted solenoid-activated lavatory faucets including electrical-operated light-beam-sensor to energize the solenoid.

2.4.4 Kitchen Sinks

ASME A112.19.3/CSA B45.4, single compartment, 20 gage stainless steel with integral mounting rim for flush installation, minimum dimensions of 30 inches wide by 21 inches front to rear, with undersides fully sound deadened, with supply openings for use with top mounted washerless sink faucets with hose spray, and with 3.5 inch drain outlet. Provide aerator with faucet. Water flow rate must not exceed 2.2 gpm when measured at a

flowing water pressure of 60 psi. Provide stainless steel drain outlets and stainless steel cup strainers. Provide separate 1.5 inch P-trap and drain piping to vertical vent piping from each compartment. Provide top mounted washerless sink faucets with hose spray.

2.4.5 Wheelchair Drinking Water Cooler

ANSI/ASHRAE 18, UL 399, NSF/ANSI/CAN 61, ADA and ICC A117.1. Dual height water cooler with more than a single thickness of metal between the potable water and the refrigerant in the heat exchanger, wall-mounted bubbler style with ASME A112.6.1M concealed chair carrier, air-cooled condensing unit, 8 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 27 inch minimum knee clearance from front bottom of unit to floor and 36 inch maximum spout height above floor for ADA side and 38 inches to 43 inches above floor for standing person side and bottle filler. Bubblers must also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

2.4.6 Shower Faucets

Provide ball joint self-cleaning shower heads. Provide WaterSense labeled showerhead with a maximum flow rate of 1.75 gpm.

2.4.7 Precast Terrazzo Mop Sinks

Terrazzo must be made of marble chips cast in white portland cement to produce 3000 psi minimum compressive strength 7 days after casting. Terrazzo can include stainless steel curb cap additions with minimum dimensions of 24 inches wide by 24 inches length by 12 inches height. Provide floor or wall outlet copper alloy body drain cast integral with terrazzo, with polished stainless steel strainers.

2.5 BACKFLOW PREVENTERS

Backflow prevention devices must be approved by the State or local regulatory agencies. If there is no State or local regulatory agency requirements, the backflow prevention devices must be listed by the Foundation for Cross-Connection Control & Hydraulic Research, or any other approved testing laboratory having equivalent capabilities for both laboratory and field evaluation of backflow prevention devices and assemblies. Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers must be meet the above requirements.

Backflow preventers with intermediate atmospheric vent must conform to ASSE 1012. Reduced pressure principle backflow preventers must conform to ASSE 1013. Hose connection vacuum breakers must conform to ASSE 1011. Pipe applied atmospheric type vacuum breakers must conform to ASSE 1001. Pressure vacuum breaker assembly must conform to ASSE 1020. Air gaps in plumbing systems must conform to ASME A112.1.2.

2.6 DRAINS

2.6.1 Floor and Shower Drains

Floor and shower drains must 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 must be cast iron except where metallic waterproofing membrane is installed. Drains must be of double drainage pattern for embedding in the floor construction. The seepage pan must have weep holes or channels for drainage to the drainpipe. The seepage pan and weep holes must not be filled or plugged and have pervious materials (such as pea gravel) or a weep hole protection device to allow drainage. The strainer must 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 must be provided when required. Drains must be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains must conform to ASME A112.6.3. Provide drain with trap primer connection, trap primer, and connection piping. Primer must meet ASSE 1018.

2.6.2 Shower Faucets and Drain Fittings

Provide single control pressure equalizing shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide WaterSense labeled showerhead with a maximum flow rate of 1.75 gpm. Provide showerheads meeting the requirements in the paragraph SHOWER FAUCETS. Provide separate globe valves or angle valves with union connections in each supply to faucet.

2.6.3 Area Drains

Area drains must be plain pattern with polished stainless steel perforated or slotted grate and bottom outlet. The drain must be circular or square with a 12 inch nominal overall width or diameter and 10 inch nominal overall depth. Drains must be cast iron with manufacturer's standard coating. Grate must be easily lifted out for cleaning. Outlet must be suitable for inside caulked connection to drain pipe. Drains must conform to ASME A112.6.3.

2.6.4 Trap Seal Protection

2.6.4.1 Potable Water-Supplied Trap Seal Valve

Trap must be supplied with a source of potable water. The trap seal primer valve must conform to ASSE 1018. The discharge from the valve must connect to the trap seal on the inlet side of the trap.

2.6.4.2 Waste Water-Supplied Trap Seal Device

Trap will be supplied with a source of waste water conforming to ASSE 1044. The discharge from the device must connect to the trap above the trap seal on the inlet side of the trap.

2.6.4.3 Barrier-Type Trap Seal Protection Device

Trap must be protected with a barrier-type trap seal protection device conforming to ASSE 1072 and must be installed in accordance with the manufacturer's instructions.

2.7 SHOWER PAN

Shower pan may be copper, or nonmetallic material.

2.7.1 Sheet Copper

Sheet copper must be 16 ounce weight.

2.7.2 Plasticized Polyvinyl Chloride Shower Pan Material

Material must be sheet form. The material must be 0.040 inch minimum thickness of plasticized polyvinyl chloride or chlorinated polyethylene and must be in accordance with ASTM D4551.

2.7.3 Nonplasticized Polyvinyl Chloride (PVC) Shower Pan Material

Material must consist of a plastic waterproofing membrane in sheet form. The material must be 0.040 inch minimum thickness of nonplasticized PVC and must have the following minimum properties:

a. or ASTM D638:

Ultimate Tensile Strength:	2600 psi
Ultimate Elongation:	398 percent
100 Percent Modulus:	445 psi

b. ASTM D1004:

Tear Strength:	300 pounds per inch

c. ASTM E96/E96M:

Permeance:	0.008 perms

d. Other Properties:

Specific Gravity:	1.29
PVC Solvent:	Weldable
Cold Crack:	minus 53 degrees F
Dimensional stability	212 degrees F minus 2.5 percent
Hardness, Shore A:	89

2.8 TRAPS

Unless otherwise specified, traps must be plastic per ASTM F409 or copper-alloy adjustable tube type with slip joint inlet and swivel. Traps must be without a cleanout. Provide traps with removable access panels for easy clean-out at sinks and lavatories. Tubes must be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets must have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints must be below the discharge level and must be of metal-to-metal or metal-to-plastic type as required for the application. Nuts must have flats for wrench grip. Outlets must have internal pipe thread, except that when required for the application, the outlets must have sockets for solder-joint connections. The depth of the water seal must be not less than 2 inches. The interior diameter must be not more than 1/8 inch over or under the nominal size, and interior surfaces must 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 must be provided for lavatories. The assembly must be a standard manufactured unit and may have a rubber-gasketed swivel

joint.

2.9 WATER HEATERS

Water heater types and capacities must be as indicated. Each water heater must have replaceable anodes. Each primary water heater must have controls with an adjustable range that includes 90 to 160 degrees F. Each gas-fired water heater and booster water heater must have controls with an adjustable range that includes 120 to 180 degrees F. Hot water systems utilizing recirculation systems must be tied into building off-hour controls. The thermal efficiencies and standby heat losses must conform to TABLE III in PART 3 of this Section for each type of water heater specified. The only exception is that storage water heaters and hot water storage tanks having more than 500 gallons storage capacity need not meet the standard loss requirement if the tank surface area is insulated to R-12.5 and if a standing light is not used. Plastic materials polyetherimide (PEI) and polyethersulfone (PES) are forbidden to be used for vent piping of combustion gases. A factory pre-charged expansion tank must be installed on the cold water supply to each water heater. Expansion tanks must be specifically designed for use on potable water systems and must be rated for 200 degrees F water temperature and 150 psi working pressure. The expansion tank size and acceptance volume must be as indicated.

2.9.1 Automatic Storage Type

Heaters must be complete with control system, temperature gauge, and pressure gauge, and must have ASME rated combination pressure and temperature relief valve.

2.9.1.1 Electric Type

Electric type water heaters must conform to UL 174 with dual heating elements. Each element must be 4.5 KW. The elements must be wired so that only one element can operate at a time.

2.10 PUMPS

2.10.1 Circulating Pumps

Domestic hot water circulating pumps must be electrically driven, single-stage, centrifugal, with mechanical seals, suitable for the intended service. Pump and motor must be supported by the piping on which it is installed. The shaft must be one-piece, heat-treated, corrosion-resisting steel with impeller and smooth-surfaced housing of bronze.

2.10.1.1 Circulating Pump Enclosure

Motor must be totally enclosed, fan-cooled and must have sufficient horsepower for the service required. Each pump motor must be equipped with an across-the-line magnetic controller in a NEMA 250, Type 1 enclosure with "START-STOP" switch in cover.

2.10.1.2 Circulating Pump Size and Efficiency

Integral size motors must be premium efficiency type in accordance with NEMA MG 1. Pump motors smaller than 1 hp Fractional horsepower pump motors must have integral thermal overload protection in accordance with Section

26 20 00 INTERIOR DISTRIBUTION SYSTEM. Guards must shield exposed moving parts.

2.10.2 Flexible Connectors

Flexible connectors must be provided at the suction and discharge of each pump that is 1 hp or larger. Connectors must be constructed of neoprene, rubber, or braided bronze, with Class 150 standard flanges. Flexible connectors must be line size and suitable for the pressure and temperature of the intended service.

2.11 DOMESTIC WATER SERVICE METER

Cold water meters 2 inches and smaller must be positive displacement type conforming to AWWA C700. Cold water meters 2-1/2 inches and larger must be turbine type conforming to AWWA C701. Water meters must be positive displacement, type. Meter register may be round or straight reading type, as provided by the local utility. Meter must 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 high efficiency type, single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

2.12.1 Electrical Requirements for Motors

Motors must be rated for continuous duty with the enclosure specified. Motor duty requirements must allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque must be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings must be fitted with grease supply fittings and grease relief to outside of the enclosure.

2.12.2 Electrical Requirements for Controllers and Contactors

Controllers and contactors must have auxiliary contacts for use with the controls provided. 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, must be provided. For packaged equipment, the manufacturer must provide controllers, including the required monitors and timed restart.

2.12.3 Electrical Requirements for Power Wiring

Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

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 MSS SP-58 Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.13.4 Nameplates

Provide 0.125 inch 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 0.25 inch high normal block lettering into the white core. Minimum size of nameplates must be 1.0 by 2.5 inches. 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 must conform to NFPA 90A requirements. Piping located in shafts that constitute air ducts or that enclose air ducts must 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 must be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Submit diagrams, instructions, and other sheets proposed for posting for Plumbing System. Submit for Plumbing System manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe. Water and drainage piping must be extended 5 feet outside the building, unless otherwise indicated. A full port ball valve and drain must be installed on the water service line inside the building approximately 6 inches above the floor from point of entry. Piping must be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes must be laid in separate trenches, except when otherwise shown. Exterior underground utilities must be at least 12 inches 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 must be marked with a stake or other acceptable means. Valves must be installed with control no lower than the valve body. Avoid the use of combination double wye and one-eighth bend fittings in the horizontal orientation below grade or below slab.

3.1.1 Water Pipe, Fittings, and Connections

3.1.1.1 Utilities

The piping must be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system must 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, must 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 must be anchored to prevent movement.

3.1.1.2 Cutting and Repairing

The work must be carefully laid out in advance, and unnecessary cutting of construction must be avoided. Damage to building, piping, wiring, or equipment as a result of cutting must be repaired by mechanics skilled in the trade involved.

3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings must be closed with caps or plugs during installation. Fixtures and equipment must be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment must be thoroughly cleaned, adjusted, and operated. Safety guards must be provided for exposed rotating equipment.

3.1.1.4 Mains, Branches, and Runouts

Piping must be installed as indicated. Pipe must be accurately cut and worked into place without springing or forcing. Structural portions of the building must not be weakened. Aboveground piping must 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 must be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines must 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 must not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes must 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 must be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends must 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 must consist of 3/4 inch hose bibb with renewable seat and full port ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps must be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

3.1.1.6 Expansion and Contraction of Piping

Allowance must be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser must have expansion loops or other provisions such as offsets and changes in direction where indicated and required. Risers must be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers must be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length must be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility must be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility must 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 4 inches in diameter or larger must be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking must 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 2000 psi after 28 days. Blocking must be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed on drawings, the base and thrust bearing sides of the thrust block must be poured against undisturbed earth. The side of the thrust block not subject to thrust must be poured against forms. The area of bearing will be as indicated on drawings. Blocking must 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, must 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 must be provided on hot- and cold-water supplies and must be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, must be accessible by means of access doors or removable panels. Commercial-type water hammer arresters must conform to ASSE 1010. Vertical capped pipe columns will not be permitted.

3.1.2 Joints

Installation of pipe and fittings must 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 must be made up with fittings of compatible material and made for the specific purpose intended.

3.1.2.1 Threaded

Threaded joints must have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads must be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or must have a polytetrafluoroethylene tape applied.

3.1.2.2 Unions and Flanges

Unions, flanges and mechanical couplings must not be concealed in walls, ceilings, or partitions. Unions must be used on pipe sizes 2-1/2 inches and smaller; flanges must be used on pipe sizes 3 inches and larger.

3.1.2.3 Copper Tube and Pipe

a. Brazed. Brazed joints must be made in conformance with AWS B2.2/B2.2M, ASME B16.50, and CDA A4015 with flux and are acceptable for all pipe sizes. Copper to copper joints must include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) must include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.

b. Soldered. Soldered joints must be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints must conform to ASME B31.5 and CDA A4015. Soldered joints must not be used in compressed air piping between the air compressor and the receiver.

c. Copper Tube Extracted Joint. Mechanically extracted joints must be made in accordance with ICC IPC.

3.1.2.4 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe must have joints made with solvent cement. PVC and CPVC pipe must 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.

3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe must be made with dielectric unions or flange waterways. Dielectric waterways must have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways must have metal connections on both ends suited to match connecting piping. Dielectric waterways must be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges must meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe must be made with transition fitting for the specific purpose.

3.1.4 Pipe Sleeves and Flashing

Pipe sleeves must be furnished and set in their proper and permanent location.

3.1.4.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

a. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

b. 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 must 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 must 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 must cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly must be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

c. Sleeves must not be installed in structural members, except where indicated or approved. Rectangular and square openings must be as detailed. Each sleeve must extend through its respective floor, or roof, and must 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 must extend a minimum of 4 inches above the finished floor.

d. Unless otherwise indicated, sleeves must be of a size to provide a minimum of 1/4 inch 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 must 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.

e. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, must be sealed

as indicated with sealants conforming to ASTM C920 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 must not be sealed for interior walls which are not designated as fire rated.

f. Sleeves through below-grade walls in contact with earth must be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve must be filled with backing material and sealants in the joint between the pipe and masonry wall as specified above. Sealant selected for the earth side of the wall must be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant.

3.1.4.2 Flashing Requirements

Pipes passing through roof must be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing must be suitably formed, and the skirt or flange must extend not less than 8 inches from the pipe and must be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing must extend up the pipe a minimum of 10 inches. For cleanouts, the flashing must be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs must be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches 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 must be sealed as indicated. Flashing for dry vents must be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches 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 must be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane must be sleeved as described above. A waterproofing clamping flange must be installed.

3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets must be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet must be perforated and turned down approximately 1-1/2 inches 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 must be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant must be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper must extend not less than 8 inches from the drainpipe and must 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 must be sealed with sealant and the flashing guard must be upturned approximately 1-1/2 inches 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 must be sealed.

3.1.4.4 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 6 inches in diameter.

b. A tack-welded or banded-metal rain shield around the pipe.

3.1.4.5 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 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep must be formed around the pipe, fitting or drain. The groove must be filled with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.1.4.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations must be sealed to prevent infiltration of air, insects, and vermin.

3.1.5 Supports

3.1.5.1 General

Hangers used to support piping 2 inches and larger must be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors must 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 must 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 must be used where each pipe crosses the base support member. Spacing of the base support members must not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods must not be formed or bent.

3.1.5.2 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports must conform to MSS SP-58 except as modified herein.

a. Types 5, 12, and 26 must not be used.

b. Type 3 must not be used on insulated pipe.

c. Type 18 inserts must be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.

d. Type 19 and 23 C-clamps must be torqued per MSS SP-58 and must have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

e. Type 20 attachments used on angles and channels must be furnished with an added malleable-iron heel plate or adapter.

f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

g. Type 39 saddles must be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles must be welded to the pipe.

h. Type 40 shields must:

(1) Be used on insulated pipe less than 4 inches.

(2) Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.

(3) Have a high density insert for all pipe sizes. High density inserts must have a density of 8 pcf or greater.

i. Horizontal pipe supports must be spaced as specified in MSS SP-58 and a support must be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports must be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe must be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs must include allowances for expansion and contraction.

j. Vertical pipe must be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers must include allowances for expansion and contraction.

k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides must be provided to allow longitudinal pipe movement. Slide materials must be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints must be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:

(1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.

(2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

(3) On pipe 4 inches and larger carrying medium less that 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

l. Pipe hangers on horizontal insulated pipe must be the size of the outside diameter of the insulation. The insulation must be continuous through the hanger on all pipe sizes and applications.

m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide must include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe must be

separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.

n. Hangers and supports for plastic pipe must not compress, distort, cut or abrade the piping, and must allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3.1.5.3 Structural Attachments

Attachment to building structure concrete and masonry must be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors must be applied with a safety factor not less than 5. Supports must not be attached to metal decking. Supports must 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 must be constructed of ferrous materials only.

3.1.6 Welded Installation

Plumbing pipe weldments must be as indicated. Changes in direction of piping must 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 must 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 must conform to ASME B31.1. Weld defects must be removed and repairs made to the weld, or the weld joints must be entirely removed and rewelded. After filler metal has been removed from its original package, it must 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 must not be used.

3.1.7 Pipe Cleanouts

Pipe cleanouts must be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe must 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 must be caulked into the hub of the fitting and must be flush with the floor. Cleanouts in connection with other pipe, where indicated, must be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs must be installed in plastic pipe. Plugs must be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug must 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 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions must be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers must 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 must have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic must 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 must not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads must be cast iron.

3.2 WATER HEATERS AND HOT WATER STORAGE TANKS

3.2.1 Relief Valves

No valves must be installed between a relief valve and its water heater or storage tank. The P&T relief valve must be installed where the valve actuator comes in contact with the hottest water in the heater. Whenever possible, the relief valve must be installed directly in a tapping in the tank or heater; otherwise, the P&T valve must be installed in the hot-water outlet piping. A vacuum relief valve must be provided on the cold water supply line to the hot-water storage tank or water heater and mounted above and within 6 inches 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 must be routed horizontally and downward a minimum of 24 inches before turning in an upward direction.

3.2.3 Connections to Water Heaters

Connections of metallic pipe to water heaters must be made with dielectric unions or flanges. Use of dielectric nipples is prohibited unless internally lined and specifically designed to limit current flow between dissimilar metals.

3.2.4 Expansion Tank

A pre-charged expansion tank must be installed on the cold water supply between the water heater inlet and the cold water supply shut-off valve. The Contractor must adjust the expansion tank air pressure, as recommended by the tank manufacturer, to match incoming water pressure.

3.3 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings must 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 must be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool must be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment must be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons must be as specified. Drain lines and hot water lines of fixtures for handicapped personnel must be insulated and do not require polished chrome finish. Plumbing fixtures and accessories must be installed within the space shown.

3.3.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings must be provided.

Connections between earthenware fixtures and flanges on soil pipe must 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 must 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 Flushometer Valves

Flushometer valves must be secured to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Flushometer valves for water closets must be installed 39 inches above the floor, except at water closets intended for use by the physically handicapped where flushometer valves must be mounted at approximately 30 inches above the floor and arranged to avoid interference with grab bars. In addition, for water closets intended for handicap use, the flush valve handle must be installed on the wide side of the enclosure. Bumpers for water closet seats must be installed on the flushometer stop.

3.3.3 Height of Fixture Rims Above Floor

Lavatories must be mounted with rim 31 inches above finished floor. Wall-hung drinking fountains and water coolers must be installed with rim 42 inches above floor. Wall-hung service sinks must be mounted with rim 28 inches above the floor. Installation of fixtures for use by the physically handicapped must be in accordance with ICC A117.1.

3.3.4 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate must be made watertight by caulking or gasketing.

3.3.5 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, must be of the chair-carrier type. The carrier must provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability must be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, must be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.3.5.1 Support for Solid Masonry Construction

Chair carrier must be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate must be imbedded in the masonry wall.

3.3.5.2 Support for Concrete-Masonry Wall Construction

Chair carrier must be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate must be fastened to the concrete wall using through bolts and a back-up plate.

3.3.5.3 Support for Steel Stud Frame Partitions

Chair carrier must be used. The anchor feet and tubular uprights must be of the heavy duty design; and feet (bases) must be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, must be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.3.6 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections must not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers must be installed where indicated and in accordance with 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 must 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 must be located so that no part of the device will be submerged. Backflow preventers must 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 must not be provided around backflow preventers. Access must be provided for maintenance and testing. Each device must be a standard commercial unit.

3.3.7 Access Panels

Access panels must be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels must be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced.

3.3.8 Traps

Each trap must be placed as near the fixture as possible, and no fixture must be double-trapped. Traps installed on cast-iron soil pipe must be cast iron. Traps installed on steel pipe or copper tubing must be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D3311. Traps for acid-resisting waste must be of the same material as the pipe.

3.3.9 Shower Pans

Before installing shower pan, subfloor must be free of projections such as nail heads or rough edges of aggregate. Drain must be a bolt-down, clamping-ring type with weepholes, installed so the lip of the subdrain is flush with subfloor.

3.3.9.1 General

The floor of each individual shower, the shower-area portion of combination shower and drying room, and the entire shower and drying room where the two are not separated by curb or partition, must be made watertight with a shower pan fabricated in place. The shower pan material must be cut to size and shape of the area indicated, in one piece to the maximum extent practicable, allowing a minimum of 6 inches for turnup on walls or partitions, and must be folded over the curb with an approximate

return of 1/4 of curb height. The upstands must be placed behind any wall or partition finish. Subflooring must be smooth and clean, with nailheads driven flush with surface, and must be sloped to drain. Shower pans must be clamped to drains with the drain clamping ring.

3.4 VIBRATION-ABSORBING FEATURES

Mechanical equipment, including pumps, must be isolated from the building structure by approved vibration-absorbing features, unless otherwise shown. Submit details of vibration-absorbing features, including arrangement, foundation plan, dimensions and specifications. Each foundation must include an adequate number of standard isolation units. Each unit must consist of machine and floor or foundation fastening, together with intermediate isolation material, and must be a standard product with printed load rating. Piping connected to mechanical equipment must be provided with flexible connectors.

3.5 WATER METER REMOTE READOUT REGISTER

The remote readout register must be mounted at the location indicated or as directed by the Contracting Officer.

3.6 IDENTIFICATION SYSTEMS

3.6.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number must be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags must be 1-3/8 inch minimum diameter, and marking must be stamped or engraved. Indentations must be black, for reading clarity. Tags must be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.6.2 Pipe Color Code Marking

Color code marking of piping must be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.7 ESCUTCHEONS

Escutcheons must 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 must be fastened securely to pipe or pipe covering and must be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons must be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

3.8 TESTS, FLUSHING AND DISINFECTION

Submit 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 must indicate the final position of controls.

3.8.1 Plumbing System

The following tests must be performed on the plumbing system in accordance with ICC IPC, except that the drainage and vent system final test must 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 must include a smoke test.

b. Building Sewers Tests.

c. Water Supply Systems Tests.

3.8.1.1 Test of Backflow Prevention Assemblies

Certification of proper operation must be submitted and must 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 must have the manufacturer's representative test the device to ensure the unit is properly installed and performing as intended. The Contractor must provide written documentation of the tests performed and signed by the individual performing the tests. Backflow prevention assembly must be tested using gauges specifically designed for the testing of backflow prevention assemblies.

Backflow prevention assembly test gauges must 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 must 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 must 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 must be repaired and retested.

3.8.1.2 Shower Pans

After installation of the pan and finished floor, the drain must be temporarily plugged below the weep holes. The floor area must be flooded with water to a minimum depth of 1 inch for a period of 24 hours. Any drop in the water level during test, except for evaporation, will be reason for rejection, repair, and retest.

3.8.2 Defective Work

If inspection or test shows defects, such defective work or material must be replaced or repaired as necessary and inspection and tests must be repeated. Repairs to piping must 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 must be flushed with potable water. Sufficient water must 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 4 fps 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) must specify the number of fixtures to be operated during flushing. Contractor must 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 must be responsible for any flood damage resulting from flushing of the system. Flushing must 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 NSF/ANSI/CAN 61, Section 9, must be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

3.8.3.2 After Flushing

System must be drained at low points. Strainer screens must be removed, cleaned, and replaced. After flushing and cleaning, systems must 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 must be repaired by the Contractor. When the system flushing is complete, the hot-water system must be adjusted for uniform circulation. Flushing devices and automatic control systems must 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 must not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building must 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 must subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests must cover a period of not less than 8 hours for each system and must 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 must be disinfected. Before introducing disinfecting chlorination material, entire system must be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure must be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating material must be hypochlorites or liquid chlorine. The chlorinating material must 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.

3.8.5.1 Water Chlorination Monitoring

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 must 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.

3.8.5.2 Water Chlorination Flushing

Upon the specified verification, the system including tanks must 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 must be opened and closed several times.

3.8.5.3 Sample Testing

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 AWWA 10084. The testing method used must be EPA approved for drinking water systems and must comply with applicable local and state requirements.

3.8.5.4 Disinfection Acceptance

Disinfection must 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.

3.9 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, must 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 must be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions must be posted before acceptance testing of the systems.

3.10 PERFORMANCE OF WATER HEATING EQUIPMENT

Standard rating condition terms are as follows:

DP = Draw pattern

EF = Energy factor, minimum overall efficiency.

ET = Minimum thermal efficiency with 70 degrees F delta T.

SL = Standby loss is maximum (Btu/h) based on a 70 degrees F temperature difference between stored water and ambient requirements.

UEF = Uniform energy factor

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 more than 55 gallons and less than or equal to 120 gallons with a draw pattern (DP) of: very small must have a uniform energy factor (UEF) of 1.9236 - (0.0011 x V), low must have a uniform energy factor (UEF) of 2.0440 - (0.0011 x V), medium must have a uniform energy factor (UEF) of 2.1171 - (0.0011 x V), high must have a uniform energy factor (UEF) of 2.418 - (0.0011 x V) per 10 CFR 430.

3.10.2 Instantaneous Water Heater

3.10.2.1 Electric

a. Storage capacity less than 2 gallons with a draw pattern (DP) of: very small must have a uniform energy factor (UEF) of 0.91, low must have a uniform energy factor (UEF) of 0.91, medium must have a uniform energy factor (UEF) of 0.91, high must have a uniform energy factor (UEF) of 0.92 per 10 CFR 430.

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
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D2665, ASTM F891, (Sch 40) ASTM F1760	X	X	X	X	X	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

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
8	Seamless copper water tube, ASTM B88, ASTM B88M	X**	X**	X**	X***
10	Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for use with Item 8	X	X	X	X
33	Fittings: brass or bronze; ASME B16.15, and ASME B16.18 ASTM B828	X	X		
36	Nipples, pipe threaded ASTM A733	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: A - Cold Water Service Aboveground B - Hot and Cold Water Distribution 180 degrees F Maximum Aboveground C - Compressed Air Lubricated D - Cold Water Service Belowground Indicated types are minimum wall thicknesses. ** - Type L - Hard *** - Type K - Hard temper with brazed joints only or type K-soft temper without joints in or under floors **** - In or under slab floors only brazed joints				

TABLE III

STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE RATINGS FOR WATER HEATING EQUIPMENT

FUEL	STORAGE CAPACITY OR RATING CONDITION	INPUT RATING	TEST PROCEDURE	REQUIRED PERFORMANCE	
A. STORAGE WATER HEATERS					
Elect.	>55 gal and ≤120 gal		10 CFR 430	DP	UEF
				Very Small	1.9236 - (0.0011 x V)
				Low	2.0440 - (0.0011 x V)
				Medium	2.1171 - (0.0011 x V)
				High	2.2418 - (0.0011 x V)
C. Instantaneous Water Heater					
Elect.	<2 gal		10 CFR 430	DP	UEF
				Very Small	0.91
				Low	0.91
				Medium	0.91
				High	0.92

TERMS:

DP = Draw Pattern
EF = Energy factor, minimum overall efficiency.
ET = Minimum thermal efficiency with 70 degrees F delta T.
SL = Standby loss is maximum Btu/h based on a 70 degree F temperature difference between stored water and ambient requirements.
UEF = Uniform energy factor
V = Rated storage volume in gallons
Q = Nameplate input rate in Btu/h

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SECTION 23 03 00.00 20

BASIC MECHANICAL MATERIALS AND METHODS
08/10, CHG 3: 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.

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2023) National Electrical Safety Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2021) Motors and Generators
NEMA MG 10	(2017) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code

1.2 RELATED REQUIREMENTS

This section applies to all sections of Divisions: 21, FIRE SUPPRESSION; 22, PLUMBING; and 23, HEATING, VENTILATING, AND AIR CONDITIONING of this project specification, unless specified otherwise in the individual section.

1.3 QUALITY ASSURANCE

1.3.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use 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.

1.3.2 Service Support

The equipment items must 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 must 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

For each item of equipment, provide 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, "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.

1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions must be considered mandatory, the word "should" is interpreted as "must." Reference to the "code official" must be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" must be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" must be interpreted to mean the "lessor." References to the "permit holder" must 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, must 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 ELECTRICAL REQUIREMENTS

Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors must conform to and have electrical connections provided under

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and must have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work must be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.6 ELECTRICAL INSTALLATION REQUIREMENTS

Electrical installations must conform to IEEE C2, NFPA 70, and requirements specified herein.

1.6.1 New Work

Provide electrical components of mechanical equipment, such as motors, motor starters (except starters/controllers which are indicated as part of a motor control center), control or push-button stations, float or pressure switches, solenoid valves, integral disconnects, and other devices functioning to control mechanical equipment, as well as control wiring and conduit for circuits rated 100 volts or less, to conform with the requirements of the section covering the mechanical equipment. Extended voltage range motors are not to be permitted. The interconnecting power wiring and conduit, control wiring rated 120 volts (nominal) and conduit, the motor control equipment forming a part of motor control centers, and the electrical power circuits must be provided under Division 26, except internal wiring for components of package equipment must be provided as an integral part of the equipment. When motors and equipment furnished are larger than sizes indicated, provide any required changes to the electrical service as may be necessary and related work as a part of the work for the section specifying that motor or equipment.

1.6.2 Modifications to Existing Systems

Where existing mechanical systems and motor-operated equipment require modifications, provide electrical components under Division 26.

1.6.3 High Efficiency Motors

1.6.3.1 High Efficiency Single-Phase Motors

Unless otherwise specified, single-phase fractional-horsepower alternating-current motors must be high efficiency types corresponding to the applications listed in NEMA MG 11.

1.6.3.2 High Efficiency Polyphase Motors

Unless otherwise specified, polyphase motors must be selected based on high efficiency characteristics relative to the applications as listed in NEMA MG 10. Additionally, polyphase squirrel-cage medium induction motors with continuous ratings must meet or exceed energy efficient ratings in accordance with Table 12-6C of NEMA MG 1.

1.6.4 Three-Phase Motor Protection

Provide controllers for motors rated one 1 horsepower and larger with

electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

1.7 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 must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work.

Instruction must 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 must 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.

1.8 ACCESSIBILITY

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

Not Used

PART 3 EXECUTION

3.1 PAINTING OF NEW EQUIPMENT

New equipment painting must be factory applied or shop applied, and must be as specified herein, and provided under each individual section.

3.1.1 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 must withstand 500 hours in a salt-spray fog test. Salt-spray fog test must be in accordance with ASTM B117, and for that test the acceptance criteria must be as follows: immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen must show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment must 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 120 degrees F, the factory painting system must be designed for the temperature service.

3.1.2 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 120 degrees F must 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 must be aluminum or light gray.

a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F must receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of 1 mil; and two coats of enamel applied to a minimum dry film thickness of 1 mil per coat.

b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F must receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.

c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F must receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

-- End of Section --

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SECTION 23 05 93.00 22

TESTING, ADJUSTING, AND BALANCING FOR MECHANICAL SYSTEMS
09/19

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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (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	(2016) Ventilation for Acceptable Indoor Air Quality

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(2016; 7th ed) National Standards for Total System Balance

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. Duct System: When applied to DALT, this phrase means "complete duct system", inclusive of all ductwork, plenums, mains, branches, fittings and duct-mounted components and appurtenances, e.g. manual balancing dampers, control dampers, access doors, fire dampers, duct-mounted coils, etc. up to, but excluding air-handling equipment (e.g. AHUs, DOAUs, ERUs, VAVs) and flexible duct.

f. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling

g. NEBB: National Environmental Balancing Bureau

h. Out-of-tolerance data: Pertains only to field acceptance testing of Final DALT or TAB report. When applied to DALT work, this phrase means "a leakage rate measured during DALT field acceptance testing which exceeds the leakage rate allowed by Appendix D REQUIREMENTS FOR DUCT AIR LEAK TESTING." When applied to TAB work this phrase means "a measurement taken during TAB field acceptance testing which does not comply with the requirements indicated in the paragraph WORKMANSHIP."

i. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains within plus or minus 20 degrees Fahrenheit of the project site's winter outdoor design temperature, throughout the period of TAB data recording.

j. Season of maximum cooling load: The time of year when the outdoor temperature at the project site remains within plus or minus 5 degrees Fahrenheit of the project site's summer outdoor design temperature, throughout the period of TAB data recording.

k. 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.

l. Sound measurements terminology: Defined in AABC MN-1, NEBB MASV, or SMACNA 1858 (TABB).

m. TAB: Testing, adjusting, and balancing

n. TAB'd: Testing/Adjusting/Balancing procedures performed

o. TAB Agency: TAB Firm

p. TAB Field Leader: TAB Team Field Leader

q. TAB Supervisor: TAB Team Supervisor

r. TAB Technician: TAB Team Field Technician

s. TAB Team: TAB Agency Personnel

t. 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	HVAC Systems Testing, Adjusting, and Balancing
TAB supervisor or Team Supervisor	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) of newand existing heating, ventilating, and cooling (HVAC) air distribution systems including equipment, ducts, and piping 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 existing 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 (TAB) systems 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 Water Distribution Systems

TAB systems in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd.

Terminate piping insulation immediately adjacent to each flow control valve, automatic control valve, or device. Seal the ends of pipe insulation and the space between ends of pipe insulation and piping, with waterproof vapor barrier coating.

After completion of work under this section, insulate the flow control valves and devices as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.3.3 Domestic Hot Water Distribution Systems

TAB systems in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd.

Terminate piping insulation immediately adjacent to each flow control valve, automatic control valve, or device. Seal the ends of pipe insulation and the space between ends of pipe insulation and piping, with waterproof vapor barrier coating.

After completion of work under this section, insulate the flow control valves and devices as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.3.4 Related Requirements

Requirements for price breakdown of HVAC TAB work are specified in Section 01 20 00 PRICE AND PAYMENT PROCEDURES.

Requirements for construction scheduling related to HVAC TAB work are specified in Section 01 32 16.00 20 SMALL PROJECT CONSTRUCTION PROGRESS SCHEDULES.

1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section:

SD-01 Preconstruction Submittals

Reports of Existing Conditions;

Independent TAB Agency and Personnel Qualifications;

Pre-Field Engineering Report;

SD-06 Test Reports

Completed Pre-Final DALT Report;

Certified Final DALT Report;

Certified Final TAB Report for Proportional Balancing;

Certified Final TAB Report for Season 1;

Certified Final TAB Report for Season 2;

SD-07 Certificates

Independent TAB Agency and Personnel Qualifications;

Advance Notice of Pre-Final DALT Field Work;

Advance Notice of TAB Field Work for Proportional Balancing;

Advance Notice of TAB Field Work for Season 1;

Advance Notice of TAB Field Work for Season 2

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, commissioning, or construction. Further, submit the following, for the agency and personnel, 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.

b. TAB Agency Team Members

TAB agency employees approved to accomplish work on this contract must be permanent employees of the TAB agency. No other personnel are allowed to perform TAB work on this contract.

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 copy of AABC or NEBB or TABB TAB certificate, and documented evidence, including a list of projects, roles performed, and associated dates, 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, including a list of projects, roles performed, and associated dates, 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.

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 Project/Site Conditions

1.5.3.1 TAB Services to Obtain Existing Conditions

Conduct DALT and TAB of the indicated existing systems and equipment and submit the specified DALT and TAB reports of existing conditions for approval. Conduct this DALT and TAB work in accordance with the requirements of this section.

1.5.4 Sequencing and Scheduling

1.5.4.1 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.

1.5.4.2 DALT and TAB Submittal and Work Schedule

Comply with requirements specified in Appendix C: DALT AND TAB SUBMITTAL AND WORK SCHEDULE included at the end of this section.

1.5.5 Subcontractor Special Requirements

Perform all work in this section in accordance with the paragraph SUBCONTRACTOR SPECIAL REQUIREMENTS in Section 01 30 00 ADMINISTRATIVE REQUIREMENTS, stating that all contract requirements of this section must be accomplished directly by a first tier subcontractor. No work may be performed by a second tier subcontractor.

1.5.6 Instrument Calibration Certificates

It is the responsibility of the TAB firm to use instrumentation that meets the minimum requirements of the standard under which the TAB Firm's qualifications are approved for use on a project. Instrumentation must be in proper operating condition and must be applied in accordance with the instrumentation's manufacturer recommendations.

All instrumentation must bear a valid NIST traceable calibration certificate during field work and during government acceptance testing. All instrumentation must be calibrated within no later than one year of the date of TAB work or government acceptance testing field work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements of this section as specified in Appendix A WORK DESCRIPTIONS OF PARTICIPANTS.

3.1.1 PRE-FIELD ENGINEERING REPORT

Comply with the requirements specified in Appendix B REPORTS - DALT and TAB included at the end of this section.

3.2 PRE-DALT/TAB MEETING

Meet with the Contracting Officer's technical representative (COTR) 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 Prerequisite for DALT Field Work

Complete the following prior to starting DALT field work:

a. Receive approval of the SD-01 Preconstruction Submittals.

b. Installation and sealing in conformance with Section 23 30 00 HVAC AIR DISTRIBUTION, except as supplemented and modified by this section, of those duct systems to be DALT'd.

c. All work items and inspections indicated by the TAB Team Supervisor that need to be accomplished before DALT field work can be performed.

d. Furnish the TAB Team Supervisor a copy of the ductwork sheet metal shop or design drawings indicating the completed duct systems available for DALT.

3.3.2 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, selection of appropriate instruments to meet the accuracy requirements of measurements, accuracy of measurements, preliminary procedures, field work, workmanship and treatment of deficiencies. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.3.3 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.

3.3.4 Ductwork To Be DALT'd

All duct systems are subject to DALT including supply, return, outside air, exhaust, and relief with exception of transfer air. 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, sub-main ducts, branch main ducts, branch ducts and plenums.

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.

It is acceptable to DALT the entire duct systems for 20 percent of the total quantity of similar units (i.e. WSHPs less than 5 tons cooling capacity, VAVs, and FCUs) instead of testing 20 percent of the linear footage of duct systems for each of these units.

Sealing of all selected duct systems is prohibited, with exception of temporary end caps and connection for test apparatus, from time Contractor is notified of selections until DALT measurements are recorded.

3.3.5 DALT Testing

Perform DALT on the duct sections of each duct 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 herein and in SMACNA 1972 CD.

In spite of specifications of SMACNA 1972 CD to the contrary, DALT ductwork of construction class of 3-inch 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.

3.3.6 Completed Pre-Final DALT Report

After completion of the DALT work, prepare a Pre-final DALT Report meeting the additional requirements specified in Appendix B REPORTS - DALT and TAB. Data required by those data report forms shall be furnished by the TAB team. Prepare the report neatly and legibly; the Pre-final DALT report shall provide the basis for the Final DALT Report.

TAB supervisor shall review, approve and sign the Pre-Final DALT Report and submit this report within two days of completion of DALT field work. Verbally notify the COTR that the field check of the Pre-Final DALT Report data can commence.

Further, if any data on the Pre-final DALT report form for a given duct section is out-of-tolerance, report the failure, notify the COTR, and resolve all deficiencies. Repairs shall be applied to similar conditions in all untested duct systems. For each failed duct section, DALT shall be conducted on one additional duct section as selected by the COTR.

3.3.7 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 Acceptance Testing Measurement for a given duct section is out-of-tolerance, report the failure, and resolve all deficiencies. Repairs shall be applied to similar conditions in all untested duct systems. For each failed duct section, DALT shall be conducted on one additional duct section as selected by the COTR.

3.3.8 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.

3.3.9 Certified Final DALT Report

On successful completion of all field checks of the Pre-Final DALT Report data for all systems, the TAB Supervisor shall assemble, review, approve, sign and submit the Final DALT Report in compliance with Appendix B REPORTS - DALT and TAB to the Contracting Officer for approval.

3.4 TAB PROCEDURES

3.4.1 Prerequisite for TAB Field Work

Complete the following prior to starting TAB field work:

a. All DALT field work and obtain approval of the Certified Final DALT Report.

b. All work items and inspections indicated by the TAB Team Supervisor that need to be accomplished before TAB field work can be performed.

c. Approval of the manufacturer's equipment start-up forms for each piece of equipment to be TAB'd.

d. Prerequisite TAB requirements of Section 01 91 00.15 BUILDING COMMISSIONING.

3.4.2 TAB Field Work

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 systems until measured flow rates (air and water flow) are in compliance with the paragraph WORKMANSHIP. Conduct TAB work, including measurement accuracy, and sound measurement work in conformance with the AABC MN-1 and or NEBB PROCEDURAL STANDARDS 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 measurement data which can be deferred until Season 1 and Season 2 is that data which would be affected in terms of accuracy due to outside ambient conditions and is reported in TAB Report for Season 1 and for Season 2. TAB Report for Proportional Balancing may include data for Season 1 when measured within seasonal limitations.

3.4.3 Preliminary Procedures

Use the approved pre-field engineering report, in addition to all applicable requirements within this section, 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 Contractor to provide and install test ports as required by the TAB engineer.

3.4.4 TAB Air Distribution Systems

3.4.4.1 Air Handling Units

Air handling unit systems including fans (air handling unit fans, exhaust fans and winter ventilation fans), coils, ducts, plenums, mixing boxes, terminal units, variable air volume boxes, and air distribution devices for supply air, return air, outside air, mixed air relief air, and makeup air.

3.4.4.2 Rooftop Air Conditioning

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.

3.4.4.3 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.

3.4.5 TAB Water Distribution Systems

3.4.5.1 Domestic Hot Water System

Domestic hot water systems including boilers, water heaters, pumps, system balancing valves, and flow measuring devices.

3.4.6 TAB Building Pressure

Record building differential pressure for all sides of the building on each floor where openings exist to obtain differential pressure measurements. Report all system setup parameters affecting building pressure measurement (e.g. exhaust/relief, outdoor air) and indicate wind speed during time of building pressure measurements. Measure in maximum and minimum building systems configuration.

3.4.6.1 Mail Room & Loading Dock

In accordance with UFC 4-010-01 Change 3, 24 May 2024, Chapter 3-18.2 Dedicated Exhaust Systems: "Provide dedicated exhaust systems within mail rooms and loading docks to maintain slight negative air pressures (minimum of 0.05 in. of water) with respect to the remainder of the buildings in which the mail rooms and loading docks are located so that the flow of air is into and contained in the mail rooms and loading docks. Though the airflow into the mail rooms and loading docks will not eliminate the potential spread of contamination by personnel leaving the mail room or the loading dock, it will limit the migration of airborne contaminants through openings and open doorways."

This applies to "205 WORK ROOM" and "210 LOADING/SORTING".

3.4.7 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. Further, balance air distribution systems until measured outside air flow rates are within plus 10 percent and minus 0 percent of design flow rates and measured exhaust air flow rates are within plus 0 percent and minus 10 percent of design flow rates as specified or indicated on the contract documents, except so not violate code minimum airflow requirements. For air terminals with volumetric flow rates 50 CFM or less, conduct TAB work until measured flow rates are within the greater of: plus 10 or minus 10 percent, or plus 3 CFM or minus 3 CFM. 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.

Conduct TAB field acceptance testing verifying measured data falls within the range of plus 5 to minus 5 percent of the TAB Report data. Further, verify measured volumetric flow rates for air terminals 50 CFM or less fall within the greater of: plus 10 or minus 10 percent, or plus 3 CFM or minus 3 CFM from design flow rates.

3.4.8 Design/Construction 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 to the Contractor and the Contracting Officer.

Within 3 working days after the TAB Agency has encountered any design or installation 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:

a. TAB Field Work: the TAB Agency must issue notice and request direction in the notification submittal.

b. COTR TAB Field Acceptance Testing or Commissioning: the TAB Agency must issue notice and the Contractor must, within 5 working days of the TAB Agency notice, submit written notification directly to the Contracting Officer, with a separate copy to the TAB Agency, of all such deficiencies, the intended or implemented corrective action, the planned or actual date(s) for completion of each corrective action.

The Contractor must submit notification of construction deficiencies in accordance with the paragraph titled INFORMATION FOR THE CONTRACTING OFFICER in Section 01 45 00 QUALITY CONTROL. This notification is in lieu of other notification within this section.

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.

3.4.9 TAB Reports

Additional requirements for TAB Reports are specified in Appendix B REPORTS - DALT and TAB

3.4.10 Quality Assurance - COTR TAB Field Acceptance Testing

3.4.10.1 TAB Field Acceptance Testing

Field acceptance testing of performance capacity data from TAB work with seasonal limitations is to be performed during comparable outdoor conditions as those during the TAB work for the approved Final TAB Report for Season 1 and for Season 2, respectively, as determined by the COTR.

During the field acceptance testing, verify, in the presence of the COTR,

random selections of data (water, air quantities, air motion, temperature, pressure, 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 required for TAB work for the TAB Report.

Field acceptance testing includes verification of TAB Report data recorded for the following equipment groups:

Group 1: All chillers, boilers, cooling towers, pumps, return fans, computer room units, energy recovery units, and air handling units (rooftop and central stations).

Group 2: 25 percent of the terminal units (e.g.: VAV boxes, water source heat pumps, fan coil units, etc.) and associated diffusers and registers.

Group 3: 25 percent of the supply diffusers, registers, grilles associated with air handling equipment (e.g.: AHUs, water source heat pumps, fan coil units, etc.).

Group 4: 25 percent of the return grilles, return registers, exhaust grilles and exhaust registers.

Group 5: 25 percent of the supply fans and exhaust fans.

3.4.10.2 Additional COTR TAB Field Acceptance Testing

If any of the acceptance testing measurements for a given equipment group is found out of tolerance, 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.

3.4.10.3 Prerequisite for Approval

Compliance with the field acceptance testing requirements of this section is a prerequisite for the final Contracting Officer approval of the Final TAB Report submitted and of the acceptance of the facility for occupancy.

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. Label variable frequency drives with final frequency (Hz) and control setpoint. 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.

3.7 APPENDICES

Appendix A WORK DESCRIPTIONS OF PARTICIPANTS
Appendix B REPORTS - DALT and TAB
Appendix C DALT AND TAB SUBMITTAL AND WORK SCHEDULE
Appendix D REQUIREMENTS FOR DUCT AIR LEAK TESTING

3.7.1 Appendix A

WORK DESCRIPTIONS OF PARTICIPANTS

The Contractor is responsible for ensuring compliance with all requirements of this specification section. However, the following delineation of specific work items is provided to facilitate and co-ordinate execution of the various work efforts by personnel from separate organizations.

1. Contractor

a. HVAC documentation: Provide pertinent contract documentation to the TAB Firm, to include the following: the contract drawings and specifications; copies of the approved submittal data for all HVAC equipment, air distribution devices, and air/water measuring/balancing devices; the construction work schedule; and other applicable documents requested by the TAB Firm. Provide the TAB Firm copies of contract revisions and modifications as they occur.

b. Schedules: Ensure the requirements specified in Appendix C "DALT and TAB Submittal and Work Schedule" are met.

c. Pre-DALT / TAB meeting: Arrange and conduct the Pre-DALT and TAB meeting. Ensure that a representative is present for the sheet metal contractor, the mechanical contractor, the electrical contractor, and the automatic temperature controls contractor.

d. Advance Notice: Monitor the completion of the duct systems' installation and provide the Advance Notice for Pre-Final DALT field work as specified.

e. Coordinate Support: Provide and coordinate support personnel required by the TAB Firm in order to accomplish the DALT and TAB field work. Support personnel may include factory representatives, HVAC controls installers, HVAC equipment mechanics, sheet metal workers, pipe fitters, and insulators. Ensure support personnel are present at the work site at the times required.

f. Correct Deficiencies: Ensure the resolution of Construction Deficiencies are provided as specified herein. Refer to the paragraph DESIGN/CONSTRUCTION DEFICIENCIES. Correct each deficiency as soon as practical with the Contracting Officer, and submit revised schedules and other required documentation.

g. Pre-TAB Field 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 pre-TAB field work items, the deficiencies pointed out by the TAB team supervisor in the design review report.

   Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's DALT and TAB Work Procedures Summary.

h. Give Notice of Testing: Submit advance notice of proportional

balancing, Season 1, and Season 2 TAB field work.

i. Insulation work: Insulatiom must not be installed on ducts to be DALT'd until DALT field acceptance testing on the subject ducts is complete.

Ensure the duct and piping systems are properly insulated and vapor sealed upon the successful completion and acceptance of the DALT and TAB work.

j. Duct Concealment: Ducts to be DALT'd must not be concealed until DALT field acceptance testing on the subject ducts is complete.

2. 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. Schedule: Ensure the requirements specified in Appendix C "DALT and TAB Submittal and Work Schedule" are met.

c. Submittals: Provide the submittals specified herein.

d. Pre-DALT/TAB meeting: Attend meeting with Contractor. Ensure TAB personnel that will be involved in the TAB work under this contract attend the meeting.

e. Pre-Field Engineering Report: Submit typed report described in Appendix B "Reports - DALT and TAB".

f. 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 Pre-Field Engineering Report or during the DALT or TAB field work.

Ensure the Contractor is properly notified and aware of all support personnel needed to perform the TAB work. Maintain communication with the Contractor regarding support personnel throughout the duration of the TAB field work, including the TAB field acceptance testing checking.

Ensure all inspections and verifications necessary to start DALT field work and TAB field work are completely and successfully conducted before DALT and TAB field work is performed.

g. Technical Assistance: Provide technical assistance to the DALT and TAB field work.

h. Deficiencies Notification: Ensure the notifications of Construction Deficiencies are provided as specified herein. Comply with requirements of the paragraph DESIGN/CONSTRUCTION DEFICIENCIES.

i. Procedures: Develop the required TAB procedures for systems or system components not covered in the TAB Standard.

3. 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 notification that all work items and inspections identified to the Contractor by the TAB team supervisor are completed, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

3.7.2 Appendix B

REPORTS - DALT and TAB

All submitted documentation must be typed, neat, and organized. All reports must have a title page, a certification page, sequentially numbered pages throughout, and a table of contents. Tables, lists, and diagrams must be titled. Generate and submit for approval the following documentation:

1. Pre-Field Engineering Report

a. DALT and TAB Procedures Summary

Submit a detailed narrative describing all aspects of the DALT and TAB field work to be performed. Clearly distinguish between DALT information and TAB information. Include the following:

(1) A list of the intended procedural steps for the DALT and TAB field work from start to finish. Indicate how each type of data measurement will be obtained. Include what Contractor support personnel are required for each step, and the tasks they need to perform.

(2) A list of the project's submittals that are needed by the TAB Firm in order to meet this Contract's requirements.

(3) The data presentation forms to be used in the report, with the preliminary information and initial design values filled in.

(4) A list of DALT and TAB instruments to be used, edited for this project, to include the instrument name and description, manufacturer, model number, scale range, published accuracy, most recent calibration date, and what the instrument will be used for on this project.

(5) A thorough checklist of the work items and inspections that need to be accomplished before DALT field work can be performed.

(6) A thorough checklist of the work items and inspections that need to be accomplished before the Season 1 TAB field work can be performed.

(7) A thorough checklist of the work items and inspections that need to be accomplished before the Season 2 TAB field work can be performed.

(8) The checklists specified above shall be individually developed and tailored specifically for the work under this contract. Refer to NEBB PROCEDURAL STANDARDS, Section III, "Preliminary TAB Procedures" under the paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" for examples of items to include in the checklists.

b. Design Review Report:

Review the contract specifications and drawings to verify that the TAB work can be successfully accomplished 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, manual volume dampers, and required straight duct and pipe runs for accurate measurements.

Submit a typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the DALT work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. If no deficiencies are evident, state so in the report.

c. TAB Schematic Drawings

The schematic drawings to be used in the required reports, may include building floor plans, mechanical room plans, duct system plans, equipment elevations, and diagrams. Indicate intended TAB measurement locations, including where test ports need to be provided by the Contractor.

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 from air handling unit schedules.

(4) Water quantities and temperatures from thermal energy transfer equipment schedules.

(5) Water quantities and heads from pump schedules.

(6) Water flow measurement fittings and balancing fittings.

d. Instrument Calibration Certificates

e. List of TAB Related Submittals
Prepare a list of the submittals from the Contract Submittal Register that relate to the successful accomplishment of all TAB. Ensure that the location and details of ports, terminals, connections, etc., necessary to perform TAB are identified on the submittals.

2. Pre-Final DALT Report

Report the data for the Pre-Final DALT Report meeting the following requirements:

a. Procedures: Describe how actual field test procedures differed from the previously approved DALT Procedures Summary.

b. Report format: Submit a comprehensive report for the DALT field work data using data presentation forms equivalent to the "Air Duct Leakage Test Summary Report Forms" located in the SMACNA 1972 CD. All form data must be recorded for each test iteration of each duct section selected. Report forms for each test must indicate either "Pass" or "Fail". 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. Node numbers shall be included in the completed report forms to identify each duct section.

c. Calculations: Include a copy of all calculations prepared in determining the duct surface area and the allowable leakage of each duct test section.

d. Instruments: Include in the DALT reports copy(s) of the calibration curve for each of the DALT test orifices used for testing. 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 are to be calibrated within one year of the date of use in the field; instrument calibration is to be traceable to the measuring standards of the National Institute of Standards and Technology.

e. TAB Supervisor Approval: Include on the submitted report the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

3. Certified Final DALT Report

On successful completion of all COTR field checks of the Pre-final DALT Report data for all systems, the TAB Supervisor shall assemble, review, sign and submit the Final DALT Report containing all Pre-Final DALT Reports to the Contracting Officer for approval.

4. TAB Reports

Submit TAB Reports for Proportional Balancing, Season 1, and Season 2 in the following manner:

a. Procedure Summary: Submit a copy of the approved DALT and TAB Procedures Summary. When applicable, provide notations describing how actual field procedures differed from the procedures listed.

b. Report format: Submit the completed data forms approved in the Pre-Field Engineering Report completed by TAB field team, reviewed, approved and signed by the TAB supervisor. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.

c. Schematic Drawings: Provide updated drawings and diagrams with final installed locations of all terminals and devices, any numbering changes, and actual test locations including duct traverse and static pressure measurement locations.

d. Air Static Pressure Profiles: Report static pressure profiles for air duct systems including: AHU-1. Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the systems listed. The static pressure report data shall include, in addition to AABC or NEBB or TABB required data, the following:

(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.

e. Duct Traverses: Report duct traverses for main and branch main supply, return, exhaust, relief and outside air ducts. This shall include 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. Report all individual velocities on the duct traverses taken. Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a pitot traverse plane as defined by AMCA 203, "Field Measurements", Section 8, paragraph 8.3, "Location of Traverse Plane". Report duct traverses for all entering and leaving unit airflows for all air handling equipment exceeding 5,000 cfm. Illustrate in an Equipment Diagram representative of the actual installation.

f. Open Paths: Ensure all required air and hydronic system open paths are identified.

g. 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 shall provide accuracy of plus or minus 5 percent at the measured face velocities.

h. Performance Curves: Include in the TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job, and manufacturer equipment data curves or tables correlating pressure drop and water flow rate.

i. Calibration Curves: The TAB Supervisor shall include, in the TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturis and flow orifices TAB'd on the job.

j. Supporting Documents: Provide copies of any request for information (RFIs) with the RFI responses, summaries of implemented change order(s), meeting minutes with participants, telephone transcripts with participants, electronic mail with addresses, and other documentation substantiating any deviations of the reported data from the initial contract design documents. Include this documentation in an appendix to the TAB report with sequential numbering of each separate document for reference to the data presentation forms.

k. Data From TAB Field Work: After completion of the TAB field work, prepare the TAB field data for TAB supervisor's review and approval signature, using the reporting forms approved in the Pre-Field Engineering Report. Data required by those approved data report forms shall be furnished by the TAB team. Record final hydronic differential pressure setpoint, hydronic system fill pressure, glycol percentage, pumps and fan motor frequency in maximum, fan motor frequency in minimum, fan brake horsepower, calibration coefficients, and factors, and primary air static pressure setpoint. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph WORKMANSHIP.

l. System configuration: Clearly identify system configurations and conditions affecting data for all reported data. Include all system operational parameters such as device positioning, system diversity, modes of operation, and setpoints necessary to setup and duplicate system cconfiguration.

3.7.3 Appendix C

DALT AND TAB SUBMITTAL AND WORK SCHEDULE

Perform the following items of work in the order listed adhering to the dates schedule specified below. Include the major items listed in this schedule in the project network analysis schedule required by Section.

Submit Independent TAB Agency and TAB Personnel Qualifications: Within 42 calendar days after date of contract award.

Submit the Pre-Field Engineering Report: Within 28 days after receipt of the approved Independent TAB Agency and TAB Personnel Qualifications.

Meet with the COTR at the Pre-DALT/TAB Meeting: Within 14 calendar days.

(1) Prior to commencement of ductwork installation.

(2) Prior to the ductwork installation preparatory meeting per specification section.

Advance Notice of Pre-Final DALT Field Work: After the completed installation of the HVAC duct system to be DALT'd, submit to the Contracting Officer an Advance Notice of Pre-Final DALT Field Work.

Ductwork Selected for DALT: Within 14 calendar days after receiving an acceptable Advance Notice of Pre-Final DALT Field Work, the Contracting Officer's technical representative (COTR) will select the project ductwork sections to be DALT'd.

DALT Field Work: Within 48 hours of COTR's selection, complete DALT field work on selected project ductwork.

Submit Pre-Final DALT Report: Within two working days 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.

Quality Assurance - COTR DALT Field Checks: Upon approval of the Pre-final DALT Report, the COTR's DALT field check work shall be scheduled with the Contracting Officer.

Submit Final DALT Report: Within 14 calendar days after successful completion of all DALT Work Field Checks

TAB field work for Season 1 may be accomplished concurrent with TAB field work for proportional balancing, when the ambient temperature is within Season 1 limits. When accomplished concurrently, Season 1 TAB Report submittal and Season 1 Quality Assurance shall be concurrent with the Proportional Balancing work items.

Advance Notice of TAB Field Work for Proportional Balancing: At a minimum of 14 calendar days prior to TAB Field Work, submit advance notice of TAB field work for proportional balancing.

TAB Field Work for Proportional Balancing: At a minimum of 84

calendar days prior to Beneficial Occupancy Date (BOD), accomplish TAB field work for proportional balancing, and Season 1, if concurrent.

Submit TAB Report for Proportional Balancing: Within 14 calendar days after completion of TAB field work for proportional balancing, and Season 1, if concurrent.

Proportional Balancing Quality Assurance - COTR TAB Field Acceptance Testing: Within 30 calendar days after TAB report for proportional balancing, and Season 1, if concurrent, is approved by the Contracting Officer, conduct TAB field acceptance testing.

Complete TAB Work for Proportional Balancing: Prior to BOD, complete all TAB work except Season 1 and Season 2 TAB work and submit Final TAB Report for Proportional Balancing.

When not accomplished concurrent with TAB field work for proportional balancing, accomplish the following seasonal items of work:

Advance Notice of Season 1 TAB Field Work: At a minimum of 14 calendar days prior to Season 1 TAB Field Work, submit advance notice of Season 1 TAB field work.

Season 1 TAB Field Work: At a minimum of 84 calendar days prior to BOD, and when the ambient temperature is within Season 1 limits, accomplish Season 1 TAB field work.

Submit Season 1 TAB Report: Within 14 calendar days after completion of Season 1 TAB field work.

Season 1 Quality Assurance - COTR TAB Field Acceptance Testing: Within 30 calendar days after Season 1 TAB report is approved by the Contracting Officer, conduct Season 1 TAB field acceptance testing.
Advance Notice of Season 2 TAB Field Work: At a minimum of 126 calendar days after CCD, submit Advance Notice of Season 2 TAB Field Work.

Season 2 TAB Field Work: Within 14 calendar days after date of advance notice of Season 2 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 14 calendar days after completion of Season 2 TAB field work.

Season 2 Quality Assurance - COTR TAB Field Acceptance Testing: Within 28 calendar days after the Season 2 TAB report is approved by the Contracting Officer, conduct Season 2 field acceptance testing.

Complete Season 2 TAB Work: Within 14 calendar days after the completion of Season 2 TAB field data check, complete all TAB work.

3.7.4 Appendix D

REQUIREMENTS FOR DUCT AIR LEAK TESITNG

Refer to design drawings for the Duct Construction and Leakage Testing Table

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SECTION 23 07 00

THERMAL INSULATION FOR MECHANICAL SYSTEMS
02/13, CHG 7: 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. 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.

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

ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A240/A240M	(2024b) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A580/A580M	(2018) Standard Specification for Stainless Steel Wire
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C195	(2007; R 2013) Standard Specification for Mineral Fiber Thermal Insulating Cement
ASTM C450	(2008) Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging
ASTM C533	(2017) Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534/C534M	(2020a) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C547	(2019) Standard Specification for Mineral Fiber Pipe Insulation

ASTM C552	(2021) Standard Specification for Cellular Glass Thermal Insulation
ASTM C647	(2008; R 2013) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C755	(2019b) Standard Practice for Selection of Water Vapor Retarders for Thermal Insulation
ASTM C795	(2008; R 2018) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C920	(2018; R 2024) Standard Specification for Elastomeric Joint Sealants
ASTM C921	(2010) Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	(2021) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C1710	(2011) Standard Guide for Installation of Flexible Closed Cell Preformed Insulation in Tube and Sheet Form
ASTM D882	(2012) Tensile Properties of Thin Plastic Sheeting
ASTM D2863	(2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
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	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2024) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E2231	(2019) Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2758	(2014) Paper - Determination of Bursting Strength

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds	(8th Ed) National Commercial & Industrial Insulation Standards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2024) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 90B	(2021) Standard for the Installation of Warm Air Heating and Air Conditioning Systems

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

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-3316	(1987; Rev C; Am 2 1990) Adhesives, Fire-Resistant, Thermal Insulation

MIL-A-24179	(1969; Rev A; Am 2 1980; Notice 1 1987; Notice 2 2020) Adhesive, Flexible Unicellular-Plastic Thermal Insulation
MIL-PRF-19565	(1988; Rev C) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier

UNDERWRITERS LABORATORIES (UL)

UL 94	(2013; Reprint Apr 2022) UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 723	(2020) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

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. Field applied insulation materials required for use on Government-furnished items as listed in the SPECIAL CONTRACT REQUIREMENTS shall be furnished and installed by the Contractor.

1.3 SUBMITTALS

Government approval is required for all submittals. 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

MICA Plates

Pipe Insulation Systems and Associated Accessories

Duct Insulation Systems and Associated Accessories

Equipment Insulation Systems and Associated Accessories

Recycled content for insulation materials;

SD-03 Product Data

Pipe Insulation Systems;

Duct Insulation Systems

Equipment Insulation Systems

SD-07 Certificates

Indoor air quality for adhesives

SD-08 Manufacturer's Instructions

Pipe Insulation Systems;

Duct Insulation Systems

1.4 CERTIFICATIONS

1.4.1 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.

1.5 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 the approved MICA National Insulation Standards plates as supplemented by this specification. 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. Provide CFC and HCFC free insulation.

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

Provide insulation that meets or exceed the requirements of ASHRAE 90.1 - IP. 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. Materials to be used on stainless steel surfaces shall meet ASTM C795 requirements. Calcium silicate shall not be used on chilled or cold water systems. Materials shall be asbestos free. Provide product recognized under UL 94 (if containing plastic) and listed in FM APP GUIDE.

2.2.1 Adhesives

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 (HVAC duct sealants must meet limit requirements of "Other" category within SCAQMD Rule 1168 sealants table). 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.

2.2.1.1 Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C195.

2.2.1.2 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.

2.2.1.3 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 212 degrees F. 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

ASTM C920, Type S, Grade NS, Class 25, Use A.

2.2.3 Corner Angles

Nominal 0.016 inch aluminum 1 by 1 inch with factory applied kraft backing. Aluminum shall be ASTM B209, Alloy 3003, 3105, or 5005.

2.2.4 Fittings

Fabricated Fittings are the prefabricated fittings for flexible elastomeric pipe insulation systems in accordance with ASTM C1710. Together with the flexible elastomeric tubes, they provide complete system integrity for retarding heat gain and controlling condensation drip from chilled-water and refrigeration systems. Flexible elastomeric, fabricated fittings provide thermal protection (0.25 k) and condensation resistance (0.05 Water Vapor Transmission factor). For satisfactory performance, properly installed protective vapor retarder/barriers and vapor stops shall be used on high relative humidity and below ambient temperature applications to reduce movement of moisture through or around the insulation to the colder interior surface.

2.2.5 Finishing Cement

ASTM C450: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with ASTM C795.

2.2.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20X20 maximum mesh size, and glass tape shall 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 4 inch wide rolls. Class 3 tape shall be 4.5 ounces/square yard. Elastomeric Foam Tape: Black vapor-retarder foam tape with acrylic adhesive containing an anti-microbial additive.

2.2.7 Staples

Outward clinching type monel .

2.2.8 Jackets

2.2.8.1 Aluminum Jackets

Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; ASTM B209, Temper H14, Temper H16, Alloy 3003, 5005, or 3105. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch and larger diameter. Aluminum jacket circumferential seam bands shall be 2 by 0.016 inch aluminum matching jacket material. Bands for insulation below ground shall be 3/4 by 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place.

2.2.8.2 Polyvinyl Chloride (PVC) Jackets

Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, ultraviolet (UV) resistant rating or treatment and moderate chemical resistance with minimum thickness 0.030 inch.

2.2.8.3 Vapor Barrier/Vapor Retarder

Apply the following criteria to determine which system is required.

a. On ducts, piping and equipment operating below 80 degrees F or located outside shall be equipped with a vapor barrier.

2.2.9 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, 35 pounds/inch width. ASTM C921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 20 pounds/inch 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.

2.2.9.1 White Vapor Retarder All Service Jacket (ASJ)

ASJ is for use on hot/cold pipes, ducts, or equipment indoors or outdoors if covered by a suitable protective jacket. The product shall meet all physical property and performance requirements of ASTM C1136, Type I, except the burst strength shall be a minimum of 85 psi. ASTM D2863 Limited Oxygen Index (LOI) shall be a minimum of 31.

In addition, neither the outer exposed surface nor the inner-most surface contacting the insulation shall be paper or other moisture-sensitive material. The outer exposed surface shall be white and have an emittance of not less than 0.80. The outer exposed surface shall be paintable.

2.2.9.2 Vapor Retarder/Vapor Barrier Mastic Coatings

2.2.9.2.1 Vapor Barrier

The vapor barrier shall be self adhesive (minimum 2 mils adhesive, 3 mils 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.

2.2.9.2.2 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 in accordance with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions. 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 determined pursuant to ASTM C647.

2.2.9.3 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.

2.2.9.4 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 30 lb/inch 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.

2.2.9.5 Polyvinylidene Chloride Vapor Retarder Adhesive Tape

Requirements must meet the same as specified for Laminated Film Vapor Retarder above.

2.2.9.6 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 185 psi in accordance with TAPPI T403 OM ISO 2758. Tensile strength 68 lb/inch width (PSTC-1000). Tape shall be as specified for laminated film vapor barrier above.

2.2.10 Vapor Retarder Not Required

ASTM C921, Type II, Class D, minimum puncture resistance 50 Beach units on all surfaces except ductwork, where Type IV, maximum moisture vapor transmission 0.10, a minimum puncture resistance of 25 Beach units is acceptable. Jacket shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.2.11 Wire

Soft annealed ASTM A580/A580M Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

2.2.12 Insulation Bands

Insulation bands shall be 1/2 inch wide; 26 gauge stainless steel.

2.2.13 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

2.3.1 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Rock Wool: 75 percent slag of weight
Fiberglass: 20 percent glass cullet
Rigid Foam: 9 percent recovered material
Phenolic Rigid Foam: 9 percent recovered material

Provide data identifying percentage of recycled content for insulation materials.

2.3.2 Aboveground Cold Pipeline (-30 to 60 deg. F)

Insulation for outdoor, indoor, exposed or concealed applications, shall

be as follows:

2.3.2.1 Cellular Glass

ASTM C552, Type II, and Type III. Supply the insulation from the fabricator with (paragraph WHITE VAPOR RETARDER ALL SERVICE JACKET (ASJ)) ASJ vapor retarder and installed with all longitudinal overlaps sealed and all circumferential joints ASJ taped or supply the insulation unfaced from the fabricator and install with all longitudinal and circumferential joints sealed with vapor barrier mastic.

2.3.2.2 Flexible Elastomeric Cellular Insulation

Closed-cell, foam- or expanded-rubber materials containing anti-microbial additive, complying with ASTM C534/C534M, Grade 1, Type I or II. Type I, Grade 1 for tubular materials. Type II, Grade 1, for sheet materials. Type I and II shall have vapor retarder/vapor barrier skin on one or both sides of the insulation, and require an additional exterior vapor retarder covering for high relative humidity and below ambient temperature applications.

2.3.3 Aboveground Hot Pipeline (Above 60 deg. F)

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.

2.3.3.1 Mineral Fiber

ASTM C547, Types I, II or III, supply the insulation with manufacturer's recommended factory-applied jacket.

2.3.3.2 Calcium Silicate

ASTM C533, Type I indoor only, or outdoors above 250 degrees F pipe temperature. Supply insulation with the manufacturer's recommended factory-applied jacket/vapor barrier.

2.3.3.3 Flexible Elastomeric Cellular Insulation

Closed-cell, foam- or expanded-rubber materials containing anti-microbial additive, complying with ASTM C534/C534M, Grade 1, Type I or II to 220 degrees F service. Type I for tubular materials. Type II for sheet materials.

2.4 DUCT INSULATION SYSTEMS

2.4.1 Factory Applied Insulation

Provide factory-applied ASTM C552, cellular glass thermal insulation according to manufacturer's recommendations for insulation with insulation manufacturer's standard reinforced fire-retardant vapor barrier, with identification of installed thermal resistance (R) value and out-of-package R value.

2.4.1.1 Rigid Insulation

Calculate the minimum thickness in accordance with ASHRAE 90.1 - IP.

2.4.1.2 Blanket Insulation

Calculate minimum thickness in accordance with ASHRAE 90.1 - IP.

2.5 EQUIPMENT INSULATION SYSTEMS

Insulate equipment and accessories as specified in Tables 5 and 6. In outside locations, provide insulation 1/2 inch thicker than specified. Increase the specified insulation thickness for equipment where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Submit a booklet containing manufacturer's published installation instructions for the insulation systems. The instructions must be copyrighted, have an identifying or publication number, and shall have been published prior to the issuance date of this solicitation. A booklet is also required by paragraphs titled: Pipe Insulation Systems and Duct Insulation Systems.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Insulation shall only be applied to unheated and uncooled piping and equipment. 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 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 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 MICA Insulation Stds plates except where modified herein or on the drawings.

3.1.2 Firestopping

Where 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. 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 UL, FM, or a NRTL.

3.1.3 Painting and Finishing

Painting shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.1.4 Ducts/Equipment That Require Insulation

Insulation is required on all ducts, or equipment, except for omitted items as specified.

3.2 PIPE INSULATION SYSTEMS INSTALLATION

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. ASME stamps.

g. Access plates of fan housings.

h. Cleanouts or handholes.

3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors

Pipe insulation shall be continuous through the sleeve.

Provide an aluminum jacket or vapor barrier/weatherproofing self adhesive jacket (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, greater than 3 ply standard grade, silver, white, black and embossed with factory applied moisture retarder over the insulation wherever penetrations require sealing.

3.2.1.2.1 Penetrate Interior Walls

The aluminum jacket or vapor barrier/weatherproofing - self adhesive jacket (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, greater than 3 plies standard grade, silver, white, black and embossed shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.

3.2.1.2.2 Penetrating Floors

Extend the aluminum jacket from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.

3.2.1.2.3 Penetrating Waterproofed Floors

Extend the aluminum jacket rom below the backup material to a point 2 inches above the flashing with a band 1 inch from the end of the aluminum jacket.

3.2.1.2.4 Penetrating Exterior Walls

Continue the aluminum jacket required for pipe exposed to weather through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.1.2.5 Penetrating Roofs

Insulate pipe as required for interior service to a point flush with the top of the flashing and sealed with flashing sealant. Tightly butt the insulation for exterior application to the top of flashing and interior insulation. Extend the exterior aluminum jacket 2 inches down beyond the end of the insulation to form a counter flashing. Seal the flashing and counter flashing underneath with metal jacketing/flashing sealant.

3.2.1.2.6 Hot Water Pipes Supplying Lavatories or Other Similar Heated Service

Terminate the insulation on the backside of the finished wall. Protect the insulation termination with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch applied with glass tape embedded between coats (if applicable). Extend the coating out onto the insulation 2 inches and seal the end of the insulation. Overlap glass tape seams 1 inch. Caulk the annular space between the pipe and wall penetration with approved fire stop material. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration at least 3/8 inches.

3.2.1.2.7 Domestic Cold Water Pipes Supplying Lavatories or Other Similar Cooling Service

Terminate the insulation on the finished side of the wall (i.e., insulation must cover the pipe throughout the wall penetration). Protect the insulation with two coats of weather barrier mastic (breather emulsion type weatherproof mastic impermeable to water and permeable to air) with a minimum total thickness of 1/16 inch. Extend the mastic out onto the insulation 2 inches and shall seal the end of the insulation. The annular space between the outer surface of the pipe insulation and caulk the wall penetration with an approved fire stop material having vapor retarder properties. Cover the pipe and wall penetration with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration by at least 3/8 inches.

3.2.1.3 Pipes Passing Through Hangers

Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on

hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-58. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed, or factory insulated hangers (designed with a load bearing core) can be used.

3.2.1.3.1 Horizontal Pipes Larger Than 2 Inches at 60 Degrees F and Above

Supported on hangers in accordance with MSS SP-58, and Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2.1.3.2 Horizontal Pipes Larger Than 2 Inches and Below 60 Degrees F

Supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-58. An insulation insert of cellular glass, prefabricated insulation pipe hangers, or perlite above 80 degrees F shall be installed above each shield. The insert shall cover not less than the bottom 180-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.

3.2.1.3.3 Vertical Pipes

Supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-58 covering the 360-degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported with hangers in the vertical run of the pipe that are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.

3.2.1.3.4 Inserts

Covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, overlap the adjoining pipe jacket 1-1/2 inches, and seal as required for the pipe jacket. The jacket material used to cover inserts in flexible elastomeric cellular insulation shall conform to ASTM C1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Elastomeric Cellular Pipe Insulation

Flexible elastomeric cellular pipe insulation shall be tubular form for pipe sizes 6 inches and less. Grade 1, Type II sheet insulation used on pipes larger than 6 inches shall not be stretched around the pipe. On pipes larger than 12 inches, the insulation shall be adhered directly to the pipe on the lower 1/3 of the pipe. Seams shall be staggered when applying multiple layers of insulation. Sweat fittings shall be insulated with miter-cut pieces the same size as on adjacent piping. Screwed fittings shall be insulated with sleeved fitting covers fabricated from miter-cut pieces and shall be overlapped and sealed to the adjacent pipe insulation. Type II requires an additional exterior vapor retarder/barrier covering for high relative humidity and below ambient temperature applications.

3.2.1.5 Pipes in high abuse areas.

In high abuse areas such as janitor closets and traffic areas in equipment rooms, kitchens, and mechanical rooms, welded PVC , aluminum or flexible laminate cladding (comprised of elastomeric, plastic or metal foil laminate) laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket, - less than 0.0000 permeability; (greater than 3 ply, standard grade, silver, white, black and embossed) aluminum jackets shall be utilized. Pipe insulation to the 6 foot level shall be protected.

3.2.1.6 Pipe Insulation Material and Thickness

Pipe insulation materials must be as listed in Table 1 and must meet or exceed the requirements of ASHRAE 90.1 - IP

TABLE 1					
Insulation Material for Piping					
Service					
	Material	Specification	Type	Class	VR/VB Req'd
Cold Domestic Water Piping & Drinking Fountain Drain Piping					
	Cellular Glass	ASTM C552	II	2	No
Hot Domestic Water Supply & Recirculating Piping (Max 200 F)					
	Mineral Fiber	ASTM C547	I	1	No
Compressed Air Discharge (201 to 250 Degrees F					
	Calcium Silicate	ASTM C533	I		No
Exposed Lavatory Drains, Exposed Domestic Water Piping & Drains to Areas for Handicapped Personnel					
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
Horizontal Roof Drain Leaders (Including Underside of Roof Drain Fittings)					

TABLE 1					
Insulation Material for Piping					
Service					
	Material	Specification	Type	Class	VR/VB Req'd
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
	Cellular Glass	ASTM C552	III		Yes
Condensate Drain Located Inside Building					
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No
Note: VR/VB = Vapor Retarder/Vapor Barrier					

TABLE 2						
Piping Insulation Thickness (inch) 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 (inch)				
		<1	1-<1.5	1.5-<4	4-<8	> or = >8
Cold Domestic Water Piping, Makeup Water & Drinking Fountain Drain Piping						
	Cellular Glass	1.5	1.5	1.5	1.5	1.5
Hot Domestic Water Supply & Recirculating Piping (Max 200 F)						
	Mineral Fiber	1	1	1	1.5	1.5
Refrigerant Suction Piping (35 degrees F nominal)						
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A
	Cellular Glass	1.5	1.5	1.5	1.5	1.5
Compressed Air Discharge (201 to 250 Degrees F						
	Calcium Silicate	2.5	3	4	4	4.5
Exposed Lavatory Drains, Exposed Domestic Water Piping & Drains to Areas for Handicapped Personnel						
	Flexible Elastomeric Cellular	0.5	0.5	0.5	0.5	0.5

TABLE 2						
Piping Insulation Thickness (inch) 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 (inch)				
		<1	1-<1.5	1.5-<4	4-<8	> or = >8
Horizontal Roof Drain Leaders (Including Underside of Roof Drain Fittings)						
	Cellular Glass	1.5	1.5	1.5	1.5	1.5
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A
Condensate Drain Located Inside Building						
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A

3.2.2 Aboveground Cold Pipelines

The following cold pipelines for minus 30 to plus 60 degrees F, 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:

b. Horizontal and vertical portions of interior roof drains.

f. Air conditioner condensate drains.

h. Exposed lavatory drains and domestic water lines serving plumbing fixtures for handicap persons.

i. Domestic cold and chilled drinking water.

3.2.2.1 Insulation Material and Thickness

Insulation thickness for cold pipelines shall be determined using Table 2.

3.2.2.2 Factory or Field applied Jacket

Insulation shall be covered with a factory applied vapor retarder jacket/vapor barrier or field applied seal welded PVC jacket or greater than 3 ply laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.0000 permeability, standard grade, sliver, white, black and embossed for use with Mineral Fiber, Cellular Glass, and Phenolic Foam Insulated Pipe. Insulation inside the building, to be protected with an aluminum jacket or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, Embossed Silver, White & Black, shall have the insulation and vapor retarder jacket installed as specified herein. The aluminum jacket or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, embossed silver, White & Black, shall be installed as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required. In high abuse areas such as janitor closets and traffic areas in equipment rooms, kitchens, and mechanical rooms, aluminum jackets or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, embossed silver, white & black, shall be provided for pipe insulation to the 6 ft level.

3.2.2.3 Installing Insulation for Straight Runs Hot and Cold Pipe

Apply insulation to the pipe with tight butt joints. Seal all butted joints and ends with joint sealant and seal with a vapor retarder coating, greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or PVDC adhesive tape.

3.2.2.3.1 Longitudinal Laps of the Jacket Material

Overlap not less than 1-1/2 inches. Provide butt strips 3 inches wide for circumferential joints.

3.2.2.3.2 Laps and Butt Strips

Secure with adhesive and staple on 4 inch centers if not factory self-sealing. If staples are used, seal in accordance with paragraph STAPLES below. Note that staples are not required with cellular glass systems.

3.2.2.3.3 Factory Self-Sealing Lap Systems

May be used when the ambient temperature is between 40 and 120 degrees F during installation. Install the lap system in accordance with manufacturer's recommendations. Use a stapler only if specifically recommended by the manufacturer. Where gaps occur, replace the section or repair the gap by applying adhesive under the lap and then stapling.

3.2.2.3.4 Staples

Coat all staples, including those used to repair factory self-seal lap systems, with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - 0.0000 perm adhesive tape. Coat all seams, except those on factory self-seal systems, with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than

0.0000 perm adhesive tape.

3.2.2.3.5 Breaks and Punctures in the Jacket Material

Patch by wrapping a strip of jacket material around the pipe and secure it with adhesive, staple, and coat with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape. Extend the patch not less than 1-1/2 inches past the break.

3.2.2.3.6 Penetrations Such as Thermometers

Fill the voids in the insulation and seal with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

3.2.2.3.7 Flexible Elastomeric Cellular Pipe Insulation

Install by slitting the tubular sections and applying them onto the piping or tubing. Alternately, whenever possible slide un-slit sections over the open ends of piping or tubing. Secure all seams and butt joints and seal with adhesive. When using self seal products only the butt joints shall be secured with adhesive. Push insulation on the pipe, never pulled. Stretching of insulation may result in open seams and joints. Clean cut all edges. Rough or jagged edges of the insulation are not be permitted. Use proper tools such as sharp knives. Do not stretch Grade 1, Type II sheet insulation around the pipe when used on pipe larger than 6 inches. On pipes larger than 12 inches, adhere sheet insulation directly to the pipe on the lower 1/3 of the pipe.

3.2.2.4 Insulation for Fittings and Accessories

a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be sealed with joint sealant and sealed with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

b. Precut or preformed insulation shall be placed around all fittings and accessories and shall conform to MICA plates except as modified herein: 5 for anchors; 10, 11, and 13 for fittings; 14 for valves; and 17 for flanges and unions. Insulation shall be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow'. Submit a booklet containing completed MICA Insulation Stds plates detailing each insulating system for each pipe, duct, or equipment insulating system, after approval of materials and prior to applying insulation.

(1) The MICA plates shall detail the materials to be installed and the specific insulation application. Submit all MICA plates required showing the entire insulating system, including plates required to show insulation penetrations, vessel bottom and top heads, legs, and skirt insulation as applicable. The MICA plates

shall present all variations of insulation systems including locations, materials, vaporproofing, jackets and insulation accessories.

(2) If the Contractor elects to submit detailed drawings instead of edited MICA Plates, the detail drawings shall be technically equivalent to the edited MICA Plate submittal.

c. Upon completion of insulation installation on flanges, unions, valves, anchors, fittings and accessories, terminations, seams, joints and insulation not protected by factory vapor retarder jackets or PVC fitting covers shall be protected with PVDC or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or two coats of vapor retarder coating with a minimum total thickness of 1/16 inch, applied with glass tape embedded between coats. Tape seams shall overlap 1 inch. The coating shall extend out onto the adjoining pipe insulation 2 inches. Fabricated insulation with a factory vapor retarder jacket shall be protected with either greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape, standard grade, silver, white, black and embossed or PVDC adhesive tape or two coats of vapor retarder coating with a minimum thickness of 1/16 inch and with a 2 inch wide glass tape embedded between coats. Where fitting insulation butts to pipe insulation, the joints shall be sealed with a vapor retarder coating and a 4 inch wide ASJ tape which matches the jacket of the pipe insulation.

d. Anchors attached directly to the pipe shall be insulated for a sufficient distance to prevent condensation but not less than 6 inches from the insulation surface.

e. Insulation shall be marked showing the location of unions, strainers, and check valves.

3.2.2.5 Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut or premolded insulation segments shall be used under the fitting covers for elbows. Insulation segments shall be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. The covers shall be secured by PVC vapor retarder tape, adhesive, seal welding or with tacks made for securing PVC covers. Seams in the cover, and tacks and laps to adjoining pipe insulation jacket, shall be sealed with vapor retarder tape to ensure that the assembly has a continuous vapor seal.

3.2.3 Aboveground Hot Pipelines

3.2.3.1 General Requirements

All hot pipe lines above 60 degrees F, 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 & re-circulating system.

b. Steam.

c. Condensate & compressed air discharge.

d. Hot water heating.

e. Heated oil.

f. Water defrost lines in refrigerated rooms.

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.

3.2.3.2 Insulation for Fittings and Accessories

Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be sealed with joint sealant. Insulation shall be marked showing the location of unions, strainers, check valves and other components that would otherwise be hidden from view by the insulation.

3.2.3.2.1 Precut or Preformed

Place precut or preformed insulation around all fittings and accessories. Insulation shall be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity.

3.2.3.2.2 Rigid Preformed

Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow".

3.2.4 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed as specified for the applicable service inside the building. After this procedure, a laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.0000 permeability (greater than 3 ply, standard grade, silver, white, black and embossed aluminum jacket, stainless steel or PVC jacket shall be applied.

PVC jacketing requires no factory-applied jacket beneath it, however an all service jacket shall be applied if factory applied jacketing is not furnished. Flexible elastomeric cellular insulation exposed to weather shall be treated in accordance with paragraph INSTALLATION OF FLEXIBLE ELASTOMERIC CELLULAR INSULATION in PART 3.

3.2.4.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 2 inches at longitudinal and circumferential joints and shall be secured with bands at not more than 12 inch centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o'clock positions. Joints on piping 60 degrees F and below shall be sealed with metal jacketing/flashing sealant while overlapping to prevent moisture penetration. Where jacketing on piping 60 degrees F and

below abuts an un-insulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 60 degrees F shall be sealed with a moisture retarder.

3.2.4.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of breather emulsion type weatherproof mastic (impermeable to water, permeable to air) recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be provided when PVC jackets are used for straight runs of pipe. PVC fitting covers shall have adhesive welded joints and shall be weatherproof laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.0000 permeability, (greater than 3 ply, standard grade, silver, white, black and embossed, and UV resistant.

3.2.4.3 PVC Jacket

PVC jacket shall be ultraviolet resistant and adhesive welded weather tight with manufacturer's recommended adhesive. Installation shall include provision for thermal expansion.

3.2.4.4 Stainless Steel Jackets

ASTM A167 or ASTM A240/A240M; Type 304, minimum thickness of 33 gauge (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 1/2 inch.

3.3 DUCT INSULATION SYSTEMS INSTALLATION

Corner angles shall be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Air conditioned spaces shall be defined as those spaces directly supplied with cooled conditioned air (or provided with a cooling device such as a fan-coil unit) and heated conditioned air (or provided with a heating device such as a unit heater, radiator or convector).

3.3.1 Duct Insulation Minimum Thickness

Duct insulation minimum thickness in accordance with Table 4.

Table 4 - Minimum Duct Insulation (inches)	
Cold Air Ducts	2.0
Relief Ducts	2.0
Fresh Air Intake Ducts	2.0

Table 4 - Minimum Duct Insulation (inches)	
Warm Air Ducts	2.0
Relief Ducts	2.0
Fresh Air Intake Ducts	2.0

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.

b. Return air ducts.

c. Relief ducts.

d. Flexible run-outs (field-insulated).

e. Plenums.

i. Fresh air intake ducts.

Insulation for rectangular ducts shall be flexible type where concealed, minimum density 3/4 pcf, and rigid type where exposed, minimum density 3 pcf. Insulation for both concealed or exposed round/oval ducts shall be flexible type, minimum density 3/4 pcf or a semi rigid board, minimum density 3 pcf, formed or fabricated to a tight fit, edges beveled and joints tightly butted and staggered. Insulation for all exposed ducts shall be provided with either a white, paint-able, factory-applied Type I jacket or a field applied vapor retarder/vapor barrier jacket coating finish as specified, the total field applied dry film thickness shall be approximately 1/16 inch. Insulation on all concealed duct shall be provided with a factory-applied Type I or II vapor retarder/vapor barrier jacket. Duct insulation shall be continuous through sleeves and prepared openings except firewall penetrations. Duct insulation terminating at fire dampers, shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder/vapor barrier shall cover the collar, neck, and any un-insulated surfaces of diffusers, registers and grills. Vapor retarder/vapor barrier materials shall be applied to form a complete unbroken vapor seal over the insulation. Sheet Metal Duct shall be sealed in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION.

3.3.2.1 Installation on Concealed Duct

a. For rectangular, oval or round ducts, flexible insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.

b. For rectangular and oval ducts, 24 inches and larger insulation shall be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.

c. For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.

d. Insulation shall be impaled on the mechanical fasteners (self stick pins) where used and shall be pressed thoroughly into the adhesive. Care shall be taken to ensure vapor retarder/vapor barrier jacket joints overlap 2 inches. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type duct hangers.

e. Where mechanical fasteners are used, self-locking washers shall be installed and the pin trimmed and bent over.

f. Jacket overlaps shall be secured with staples and tape as necessary to ensure a secure seal. Staples, tape and seams shall be coated with a brush coat of vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate (minimum 2 mils adhesive, 3 mils embossed) - less than 0.0000 perm adhesive tape.

g. Breaks in the jacket material shall be covered with patches of the same material as the vapor retarder jacket. The patches shall extend not less than 2 inches beyond the break or penetration in all directions and shall be secured with tape and staples. Staples and tape joints shall be sealed with a brush coat of vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate (minimum 2 mils adhesive, 3 mils embossed) - less than 0.0000 perm adhesive tape.

h. At jacket penetrations such as hangers, thermometers, and damper operating rods, voids in the insulation shall be filled and the penetration sealed with a brush coat of vapor retarder coating or PVDC adhesive tape greater than 3 ply laminate (minimum 2 mils adhesive, 3 mils embossed) - less than 0.0000 perm adhesive tape.

i. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish or tape with a brush coat of vapor retarder coating.. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

j. Where insulation standoff brackets occur, insulation shall be extended under the bracket and the jacket terminated at the bracket.

3.3.2.2 Installation on Exposed Duct Work

a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches. Mechanical fasteners shall be as corrosion resistant as G60 coated galvanized steel, and shall indefinitely sustain a 50 lb tensile dead load test perpendicular to the duct wall.

b. Form duct insulation with minimum jacket seams. Fasten each piece of rigid insulation to the duct using mechanical fasteners. When the

height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder/barrier jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors.

c. Impale insulation on the fasteners; self-locking washers shall be installed and the pin trimmed and bent over.

d. Seal joints in the insulation jacket with a 4 inch wide strip of tape. Seal taped seams with a brush coat of vapor retarder coating.

e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor retarder coating.

f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a flashing sealant.

g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

h. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf, attached as in accordance with MICA standards.

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.

b. Return air ducts.

c. Relief air ducts

d. Flexible run-outs (field insulated).

e. Plenums.
i. Fresh air intake ducts.

o. Exhaust ducts passing through concealed spaces exhausting conditioned air.

Insulation for rectangular ducts shall be flexible type where concealed, and rigid type where exposed. Insulation on exposed ducts shall be provided with a white, paint-able, factory-applied Type II jacket, or finished with adhesive finish. Flexible type insulation shall be used for round ducts, with a factory-applied Type II jacket. Insulation on

concealed duct shall be provided with a factory-applied Type II jacket. Adhesive finish where indicated to be used shall be accomplished by applying two coats of adhesive with a layer of glass cloth embedded between the coats. The total dry film thickness shall be approximately 1/16 inch. Duct insulation shall be continuous through sleeves and prepared openings. Duct insulation shall terminate at fire dampers and flexible connections.

3.3.3.1 Installation on Concealed Duct

a. For rectangular, oval and round ducts, insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.

b. For rectangular and oval ducts 24 inches and larger, insulation shall be secured to the bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 18 inch centers and not more than 18 inches from duct corner.

c. For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 18 inch centers and not more than 18 inches from duct corners.

d. The insulation shall be impaled on the mechanical fasteners where used. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type hangers.

e. Self-locking washers shall be installed where mechanical fasteners are used and the pin trimmed and bent over.

f. Insulation jacket shall overlap not less than 2 inches at joints and the lap shall be secured and stapled on 4 inch centers.

3.3.3.2 Installation on Exposed Duct

a. For rectangular ducts, the rigid insulation shall be secured to the duct by the use of mechanical fasteners on all four sides of the duct, spaced not more than 16 inches apart and not more than 6 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger and a minimum of one row for each side of duct less than 12 inches.

b. Duct insulation with factory-applied jacket shall be formed with minimum jacket seams, and each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projection is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over the projection. Jacket shall be continuous across seams, reinforcing, and projections. Where the height of projections is greater than the insulation thickness, insulation and jacket shall be carried over the projection.

c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and pin trimmed and bent over.

d. Joints on jacketed insulation shall be sealed with a 4 inch wide strip of tape and brushed with vapor retarder coating.

e. Breaks and penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with adhesive and stapled.

f. Insulation terminations and pin punctures shall be sealed with tape and brushed with vapor retarder coating.

g. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation, minimum density of 3/4 pcf attached by staples spaced not more than 16 inches and not more than 6 inches from the degrees of joints. Joints shall be sealed in accordance with item "d." above.

3.3.4 Ducts Handling Air for Dual Purpose

For air handling ducts for dual purpose below and above 60 degrees F, 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.

3.4 EQUIPMENT INSULATION SYSTEMS INSTALLATION

3.4.1 General

Removable insulation sections shall be provided to cover parts of equipment that must be opened periodically for maintenance including vessel covers, fasteners, flanges and accessories. Equipment insulation shall be omitted on the following:

a. Hand-holes.

b. Boiler manholes.

c. Cleanouts.

d. ASME stamps.

e. Manufacturer's nameplates.

f. Duct Test/Balance Test Holes.

3.4.2 Insulation for Cold Equipment

Cold equipment below 60 degrees F: Insulation shall be furnished on equipment handling media below 60 degrees F including the following:

c. Drip pans under chilled equipment.

f. Duct mounted coils.

i. Roof drain bodies.

j. Air handling equipment parts that are not factory insulated.

k. Expansion and air separation tanks.

3.4.2.1 Insulation Type

Insulation shall be suitable for the temperature encountered. Material and thicknesses shall be as shown in Table 5:

TABLE 5		
Insulation Thickness for Cold Equipment (inches)		
Equipment handling media at indicated temperature		
	Material	Thickness (inches)
35 to 60 degrees F		
	Flexible Elastomeric Cellular	2
1 to 34 degrees F		

3.4.2.2 Pump Insulation

a. Insulate pumps by forming a box around the pump housing. The box shall be constructed by forming the bottom and sides using joints that do not leave raw ends of insulation exposed. Joints between sides and between sides and bottom shall be joined by adhesive with lap strips for rigid mineral fiber and contact adhesive for flexible elastomeric cellular insulation. The box shall conform to the requirements of MICA Insulation Stds plate No. 49 when using flexible elastomeric

cellular insulation. Joints between top cover and sides shall fit tightly forming a female shiplap joint on the side pieces and a male joint on the top cover, thus making the top cover removable.

b. Exposed insulation corners shall be protected with corner angles.

c. Upon completion of installation of the insulation, including removable sections, two coats of vapor retarder coating shall be applied with a layer of glass cloth embedded between the coats. The total dry thickness of the finish shall be 1/16 inch. A parting line shall be provided between the box and the removable sections allowing the removable sections to be removed without disturbing the insulation coating. Flashing sealant shall be applied to parting line, between equipment and removable section insulation, and at all penetrations.

3.4.2.3 Other Equipment

a. Insulation shall be formed or fabricated to fit the equipment. To ensure a tight fit on round equipment, edges shall be beveled and joints shall be tightly butted and staggered.

b. Insulation shall be secured in place with bands or wires at intervals as recommended by the manufacturer but not more than 12 inch centers except flexible elastomeric cellular which shall be adhered with contact adhesive. Insulation corners shall be protected under wires and bands with suitable corner angles.

c. Cellular glass shall be installed in accordance with manufacturer's instructions. Joints and ends shall be sealed with joint sealant, and sealed with a vapor retarder coating.

d. Insulation on heads of heat exchangers shall be removable. Removable section joints shall be fabricated using a male-female shiplap type joint. The entire surface of the removable section shall be finished by applying two coats of vapor retarder coating with a layer of glass cloth embedded between the coats. The total dry thickness of the finish shall be 1/16 inch.

e. Exposed insulation corners shall be protected with corner angles.

f. Insulation on equipment with ribs shall be applied over 6 by 6 inches by 12 gauge welded wire fabric which has been cinched in place, or if approved by the Contracting Officer, spot welded to the equipment over the ribs. Insulation shall be secured to the fabric with J-hooks and 2 by 2 inches washers or shall be securely banded or wired in place on 12 inch centers.

3.4.2.4 Vapor Retarder/Vapor Barrier

Upon completion of installation of insulation, penetrations shall be caulked. Two coats of vapor retarder coating or vapor barrier jacket shall be applied over insulation, including removable sections, with a layer of open mesh synthetic fabric embedded between the coats. The total dry thickness of the finish shall be 1/16 inch. Flashing sealant or vapor barrier tape shall be applied to parting line between equipment and removable section insulation.

3.4.3 Insulation for Hot Equipment

Insulation shall be furnished on equipment handling media above 60 degrees F including the following:

d. Water heaters.

3.4.3.1 Insulation

Insulation shall be suitable for the temperature encountered. Shell and tube-type heat exchangers shall be insulated for the temperature of the shell medium.

3.4.3.2 Other Equipment

a. Insulation shall be formed or fabricated to fit the equipment. To ensure a tight fit on round equipment, edges shall be beveled and joints shall be tightly butted and staggered.

b. Insulation shall be secured in place with bands or wires at intervals as recommended by the manufacturer but not greater than 12 inch centers except flexible elastomeric cellular which shall be adhered. Insulation corners shall be protected under wires and bands with suitable corner angles.

c. On high vibration equipment, cellular glass insulation shall be set in

a coating of bedding compound as recommended by the manufacturer, and joints shall be sealed with bedding compound. Mineral fiber joints shall be filled with finishing cement.

e. Exposed insulation corners shall be protected with corner angles.

h. Upon completion of installation of insulation, penetrations shall be caulked. Two coats of adhesive shall be applied over insulation, including removable sections, with a layer of glass cloth embedded between the coats. The total dry thickness of the finish shall be 1/16 inch. Caulking shall be applied to parting line between equipment and removable section insulation.

3.4.4 Equipment Exposed to Weather

3.4.4.1 Installation

Equipment exposed to weather shall be insulated and finished in accordance with the requirements for ducts exposed to weather in paragraph DUCT INSULATION INSTALLATION.

3.4.4.2 Optional Panels

At the option of the Contractor, prefabricated metal insulation panels may be used in lieu of the insulation and finish previously specified. Thermal performance shall be equal to or better than that specified for field applied insulation. Panels shall be the standard catalog product of a manufacturer of metal insulation panels. Fastenings, flashing, and support system shall conform to published recommendations of the manufacturer for weatherproof installation and shall prevent moisture from entering the insulation. Panels shall be designed to accommodate thermal expansion and to support a 250 pound walking load without permanent deformation or permanent damage to the insulation. Exterior metal cover sheet shall be aluminum and exposed fastenings shall be stainless steel or aluminum.

-- End of Section --

SECTION 23 08 00

COMMISSIONING OF MECHANICAL AND PLUMBING SYSTEMS
05/23

PART 1 GENERAL

Building Commissioning is a systematic, quality-focused process for enhancing the delivery of a project that focuses on verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the project requirements. The purpose is to reduce the cost and performance risks associated with delivering facilities projects, and to increase value to owners, occupants, and users. Comply with specification Section 01 91 00.15 BUILDING COMMISSIONING.

1.1 SEQUENCING AND SCHEDULING

Complete the following prior to starting Functional Performance Tests of mechanical systems:

a. All equipment and systems completed, cleaned, flushed, disinfected, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications

b. Final DALT Report submitted and approved in accordance with Section 23 05 93.00 22.00 22 TESTING, ADJUSTING, AND BALANCING FOR HVAC

c. Pre-final Testing, Adjusting, and Balancing Report submitted in accordance with Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING FOR HVAC

e. The Certificate of Readiness submitted and approved in accordance with Section 01 91 00.15 BUILDING COMMISSIONING

f. Air Leakage Test Reports and Diagnostic Test Reports submitted and approved in accordance with Section 01 91 00.15 BUILDING COMMISSIONING

g. Tests, Flushing, and Disinfection in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Test Equipment;

SD-06 Test Reports

Pipe Flushing, Testing, And Water Treatment Reports;

Completed Pre-Functional Checklists;

Seasonal Test Report;

SD-07 Certificates

Certificate Of Readiness;

1.3 ACCESSIBILITY REQUIREMENTS

Equipment, systems, and devices for commissioned systems must be accessible. Make necessary modifications if systems and devices are not accessible for inspections and testing.

Assist commissioning team in testing by removing equipment covers, opening access panels, and other required activities that assist with visual oversight. Furnish ladders, flashlights, meters, gauges, or other inspection equipment as necessary.

1.4 COORDINATION

Refer to Section 01 91 00.15 BUILDING COMMISSIONING for requirements pertaining to coordination during the commissioning process. Coordinate with the in accordance with Section 01 91 00.15 and in accordance with the Commissioning Plan to schedule inspections as required to support the commissioning process. Furnish additional information requested by the. Coordinate scheduling of Functional Performance Testing with the commissioning team. Provide plans, reports, notes, and other documentation to the as specified in the commissioning plan, as it is completed.

1.5 PIPE FLUSHING, TESTING, AND WATER TREATMENT REPORTS

Test requirements are specified in Division 22 and 23 piping Sections. Prepare a pipe system cleaning, flushing, and hydrostatic testing log. Provide cleaning, flushing, testing, and water treatment log and final reports.

Include the following in the pipe system cleaning, flushing, and hydrostatic testing log:

a. Minimum flushing water velocity.

b. Water treatment reports.

c. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

1.6 CERTIFICATE OF READINESS

Submit Certificate of Readiness documentation in accordance with Section 01 91 00.15 BUILDING COMMISSIONING for all equipment and systems including start-up reports; completed Pre-Functional Checklists; Testing, Adjusting, and Balancing (TAB) Report; Issues Log; HVAC Controls Start-Up Reports. Do not schedule Functional Performance Tests for the system until the Certificate of Readiness for that system receives approval by the Government. The and the Mechanical, Electrical, Controls, and TAB subcontractor representatives must sign and date the Certificate of Readiness.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

Provide all testing equipment required to perform testing for the systems to be commissioned, except for equipment specific to and used by TAB as required by Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Provide a sufficient quantity of two-way radios for each subcontractor. Submit list of Test Equipment and instrumentation to be used for testing including equipment/instrument identification number, equipment application or planned use, manufacturer, make, model, and serial number, and calibration history with certificates. Also list special equipment and proprietary tools specific to a piece of equipment required for testing.

2.1.1 Proprietary Equipment

Provide manufacturer's proprietary test equipment and software required by any equipment manufacturer for programming and start-up, whether specified or not. Provide manufacturer test equipment, demonstrate its use, and assist in the commissioning process as needed. Provide data logging equipment and software required to test equipment.

2.1.2 Calibration and Accuracy

Comply with equipment manufacturer's test equipment calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to Contracting Officer upon request.

Provide all testing equipment of sufficient quality and accuracy to test and measure system performance with the tolerances specified. Unless otherwise noted, the following minimum requirements apply: Provide temperature sensors and digital thermometers with a certified calibration within the past year to an accuracy of 0.5 degrees F and a resolution of plus or minus 0.1 degrees F. Provide pressure sensors with an accuracy of plus or minus 2.0 percent of the value range being measured (not full range of meter) and calibrated within the last year.

PART 3 EXECUTION

3.1 MEETINGS

Attend all meetings in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

Provide timely updates on construction schedule changes to allow the to execute commissioning process efficiently. Notify Contracting Officer of anticipated construction delays to commissioning activities not yet performed or not yet scheduled.

3.2 COMMISSIONING CONSTRUCTION OBSERVATION CHECKLISTS

Commissioning construction observation checklists include Pre-Functional Checklists and Functional Performance Test Checklists. Provide commissioning construction observation checklists for the Interim and Final Construction Phase Commissioning Plan in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

3.2.1 Pre-Functional Checklists

3.2.2 Functional Performance Test Checklists

3.3 PRE-FUNCTIONAL CHECKS

Pre-Functional Checks are a type of Commissioning Inspection in accordance with Section 01 91 00.15 BUILDING COMMISSIONING. Complete one Pre-Functional Checklist for each individual item of equipment or system for each system required to be commissioned including, but not limited to, ductwork, piping, equipment, fixtures, and controls. Include manufacturer start-up checklists associated with equipment with the submission of the Pre-Functional Checklists. Provide manufacturer's installation manual for each type of unit. Indicate commissioning team member inspection and validation of each Pre-Functional Checklist item by initials. Validation of each Pre-Functional Checklist item by each team member indicates that item conforms to the contract documents and validated design in their area of responsibility. Commissioning Specialist validation of each Pre-Functional Checklist item indicates that each item has been installed correctly and in accordance with contract documents. Required commissioning team members for Pre-Functional Checks includes the CxC, Mechanical Commissioning Specialist, sub-contractor representative for each trade responsible for construction/installation of the checklist item, and the TAB representative (for items impacting TAB). Submit the initialed and Completed Pre-Functional Checklists no later than 7 calendar days after completion of inspection of all checklists items for each system.

3.4 STARTUP AND INITIAL CHECKOUT

Document start-up and initial testing procedures, and include in the Completed Pre-Functional Checklists submittal, including:

a. Startup tests and factory testing reports.

b. Manufacturer's representative start-up, operating, troubleshooting and maintenance procedures.

c. Additional documentation necessary for third party certification programs.

d. Perform and clearly document system operational checks and quality control checks as they are completed, and providing a copy to the commissioning team.

e. Correct deficiencies and sign the Certificate of Readiness for each system before functional performance testing

3.5 DUCT AIR LEAKAGE TEST (DALT) REPORT REVIEW AND VERIFICATION

3.5.1 Duct Air Leakage Test (DALT) Report Review

All deficiencies must be resolved prior to DALT Report approval.

3.5.2 Duct Air Leakage Test (DALT) Report Verification

All deficiencies must be resolved prior to DALT Report approval.

3.6 TESTING, ADJUSTING, AND BALANCING REPORT REVIEW AND VERIFICATION

3.6.1 Testing, Adjusting, and Balancing (TAB) Report Review

All deficiencies must be resolved prior to TAB Report approval.

3.6.2 Testing, Adjusting, and Balancing (TAB) Report Verification

All deficiencies must be resolved prior to TAB Report approval.

3.7 HVAC CONTROLS START-UP AND PERFORMANCE VERIFICATION TEST REVIEW

All deficiencies must be resolved prior to final acceptance.

3.8 FUNCTIONAL PERFORMANCE TESTING

Functional Performance Testing are a type of Commissioning Testing in accordance with Section 01 91 00.15 BUILDING COMMISSIONING. Conduct Functional Performance Testing in accordance with Section 01 91 00.15 BUILDING COMMISSIONING and requirements in this Section. Prior to Functional Performance Testing, complete all prerequisites in accordance with paragraph SEQUENCING AND SCHEDULING. 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.

3.8.1 Test Scheduling and Coordination

Schedule and conduct Initial Functional Performance Tests. 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. 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.

Functional Performance Tests must be performed with the CxC present. Government reserves the right to witness all tests. Coordinate test schedule with Government representatives.

3.8.2 Preparation

Put equipment and systems into operation and continue operation during each working day of functional performance testing, as required. Verify temperature and pressure taps in accordance with Contract Documents. Provide a pressure/temperature plug at each water sensor which is an input point to control system.

Perform minor adjustments to equipment and systems during Functional Performance Tests as deemed necessary by the commissioning team. Where calibrated DDC sensors cannot be used to record test data, provide measuring instruments, logging devices, and data acquisition equipment to record data for the complete range of test data for the required test

period.

3.8.3 Testing Procedures

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.

Follow the Functional Performance Test from the approved Final Construction Phase Commissioning Plan. Perform Functional Performance Tests for each item of equipment and each system required to be commissioned. Verify all sensor calibrations, control responses, safeties, interlocks, operating modes, sequences of operation, capacities, and all other performance requirements comply with contract, regardless of the specific items listed within the checklists provided. In general, testing must progress from equipment or components to subsystems to systems to interlocks and connections between systems. Commissioning Specialists are responsible for determining the order of components and systems to be tested.

Indicate validation of each item of equipment and systems tested by signature of each commissioning team member for each test. The Quality Control Representative, Commissioning Specialists, and Contracting Officer's Representative, if present, must indicate validation after the equipment and systems are free of deficiencies.

3.8.4 Simulating Conditions

Functional performance testing is conducted by simulating conditions at control devices to initiate a control system response. Before testing, calibrate all sensors, transducers and devices. Over-writing control input values through the control system is not acceptable unless approved by the Contracting Officer. Perform each test under conditions that simulate actual conditions as close as is practically possible. Specific examples of simulating conditions are provided below. Do not simulate conditions when damage to the system or building may result.

a. When varying static pressures inside ductwork cannot 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 by partially blocking 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. Raising entering cooling coil temperatures by activating a heating/preheat coil 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, 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 55 degrees F, when the outside air temperature is above 55 degrees F, temporarily change the lockout set point to be 0 degrees F above the current outside air temperature. Caution: Set points are not to be raised or lowered to a point to cause damage to the components, systems, or the building structure and contents.

h. Test duct mounted smoke detectors in accordance with the manufacturer's recommendations. Perform the tests with air system at minimum airflow condition.

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.

3.8.5 Manufacturer's Representative

Provide a factory trained representative authorized by the equipment manufacturer to perform Functional Performance Testing for the following equipment:

Packaged Direct-Expansion Refrigeration Equipment, including variable refrigerant flow (VRF) systems

Booster Pumps

Packaged Air Compressors

Ensure the test representative reviews, approves, and signs the completed field test report. Include person's name with signatures.

3.8.6 Sample Strategy

Complete a Functional Performance Test Checklist for each item of equipment or system to be tested.

3.8.6.1 100 Percent Sample Procedures

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.

3.8.6.2 Less than 100 Percent Sample Procedures

Randomly test each sample group of identical equipment. If 10 percent of the units in the first sample fail the functional performance tests, test a second sample group, the same size as the first sample group. The second sample must not include any units from the first sample group.

If 10 percent of the units in the second sample fail, test all remaining units. If at any point frequent failures occur the CxC may stop the testing and require the contractor to perform and document a checkout of the remaining units prior to continuing functional testing.

3.9 RETESTING REQUIREMENTS

Abort tests if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. Re-test only after all deficiencies identified during the original tests have been corrected.

Contracting Officer may withhold payment equivalent to lost time, re-testing, and aborted tests. These costs may include salary, travel costs, and per diem for Government team members. Correct deficiencies as identified by the commissioning team and retest the systems to be commissioned.

3.10 SYSTEM ACCEPTANCE

Systems may be partially accepted prior to seasonal testing if they comply with all construction contract and accepted design requirements that can be tested during initial Functional Performance Tests. All test procedures must be successful completed prior to full systems acceptance.

3.11 SEASONAL TESTS

Perform Initial Functional Performance Tests as soon as all contract work is completed, but prior to facility turnover, regardless of the season.

In addition to the Initial Functional Performance Tests, perform Functional Performance Tests of HVAC systems during peak heating and cooling seasons during outdoor air condition design extremes. Schedule Seasonal Functional Performance Tests in coordination with the Contracting Officer. Submit Seasonal Test Report within 14 days of test completion. Include seasonal test report in the Updated Final Commissioning Report as specified in Section 01 91 00.15 BUILDING COMMISSIONING

Execute seasonal functional performance testing, witnessed by the Contracting Officer. Correct deficiencies and make adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

3.12 TRAINING

3.13 COMMISSIONING REPORT

Include all completed Pre-Functional Checklists and Functional Performance Checklists in the Commissioning Report as specified in Section 01 91 00.15 BUILDING COMMISSIONING. Include the approved TAB Report.

-- End of Section --

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SECTION 23 09 00

INSTRUMENTATION AND CONTROL FOR HVAC
02/19, CHG 3: 05/21

PART 1 GENERAL

1.1 SUMMARY

Provide a complete Direct Digital Control (DDC) system suitable for the control of the heating, ventilating and air conditioning (HVAC) and other building-level systems as indicated and shown and in accordance with Section 23 09 13.00 22 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC, Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS for BACnet or Niagara BACnet systems, and other referenced Sections.

1.1.1 Proprietary Systems

1.1.1.1 Proprietary Systems Exempted From Open Protocol Requirements

The following systems are specifically exempted from the open protocol requirements of Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS:

a. A simple split (DX) system consisting of a single indoor unit and a single outdoor unit from the same manufacturer.

1.1.1.2 Implementation of Proprietary Systems

For proprietary systems exempted from open protocol requirements, a proprietary network and DDC hardware communicating via proprietary protocol are permitted. For these systems a building control network meeting the requirements of Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS must also be provided, along with a gateway or interface to connect the proprietary system to the open building control network.

The proprietary system gateway or interface must provide the required functionaliality as shown on the points schedule. Scheduling, alarming, trending, overrides, network inputs, network outputs and other protocol related requirements must be met on the open protocol control system as specified in Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

1.1.2 System Requirements

Provide systems meeting the requirements this Section and other Sections referenced by this Section, and which have the following characteristics:

a. The system implements the control sequences of operation shown in the Contract Drawings using DDC hardware to control mechanical and electrical equipment

b. The system meet the requirements of this specification as a stand-alone system and does not require connection to any other system.

c. Control sequences reside in DDC hardware in the building. The building control network is not dependent upon connection to a Utility Monitoring and Control System (UMCS) Front End or to any other system for performance of control sequences. To the greatest extent practical, the hardware performs control sequences without reliance on the building network.

d. The hardware is installed such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.

e. All necessary documentation, configuration information, programming tools, programs, drivers, and other software are licensed to and otherwise remain with the Government such that the Government or their agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor, Vendor or Manufacturer.

f. Sufficient documentation and data, including rights to documentation and data, are provided such that the Government or their agents can execute work to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor, Vendor or Manufacturer.

g. Hardware is installed and configured such that the Government or their agents are able to perform repair, replacement, and upgrades of individual hardware without further interaction with the Contractor, Vendor or Manufacturer.

1.1.3 End to End Accuracy

Select products, install and configure the system such that the maximum error of a measured value as read from the DDC Hardware over the network is less than the maximum allowable error specified for the sensor or instrumentation.

1.1.4 Verification of Dimensions

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 any work.

1.1.5 Drawings

The Government will not indicate all offsets, fittings, and accessories that may be required on the drawings. Carefully investigate the mechanical, electrical, and finish conditions that could affect the work to be performed, arrange such work accordingly, and provide all work necessary to meet such conditions.

1.2 RELATED SECTIONS

Related work specified elsewhere:

a. Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER

BUILDING CONTROL SYSTEMS for BACnet systems with or without Niagara Framework.

b. Section 23 09 13.00 22 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

c. Section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING

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 135	(2020; Errata 1-2 2021) BACnet—A Data Communication Protocol for Building Automation and Control Networks
ASHRAE FUN IP	(2021) Fundamentals Handbook, I-P Edition

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 90A	(2024) Standard for the Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

UL 5085-3	(2006; Reprint Jan 2022) UL Standard for Safety Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers

1.4 DEFINITIONS

The following list of definitions includes terms used in Sections referenced by this Section and are included here for completeness.The definitions contained in this Section may disagree with how terms are defined or used in other documents, including documents referenced by this Section. The definitions included here are the authoritative definitions for this Section and all Sections referenced by this Section.

After each term the protocol related to that term is included in parenthesis.

1.4.1 Alarm Generation (All protocols)

Alarm Generation is the monitoring of a value, comparison of the value to alarm conditions and the creation of an alarm when the conditions set for the alarm are met.

1.4.2 Building Automation and Control Network (BACnet) (BACnet)

The term BACnet is used in two ways. First meaning the BACnet Protocol Standard - the communication requirements as defined by ASHRAE 135 including all annexes and addenda. The second to refer to the overall technology related to the ASHRAE 135 protocol.

1.4.3 BACnet Advanced Application Controller (B-AAC) (BACnet)

A hardware device BTL Listed as a B-AAC, which is required to support BACnet Interoperability Building Blocks (BIBBs) for scheduling and alarming, but is not required to support as many BIBBs as a B-BC.

1.4.4 BACnet Application Specific Controller (B-ASC) (BACnet)

A hardware device BTL Listed as a B-ASC, with fewer BIBB requirements than a B-AAC. It is intended for use in a specific application.

1.4.5 BACnet Building Controller (B-BC) (BACnet)

A hardware device BTL Listed as a B-BC. A general-purpose, field-programmable device capable of carrying out a variety of building automation and control tasks including control and monitoring via direct digital control (DDC) of specific systems and data storage for trend information, time schedules, and alarm data. Like the other BTL Listed controller types (B-AAC, B-ASC etc.) a B-BC device is required to support the server ("B") side of the ReadProperty and WriteProperty services, but unlike the other controller types it is also required to support the client ("A") side of these services. Communication between controllers requires that one of them support the client side and the other support the server side, so a B-BC is often used when communication between controllers is needed.

1.4.6 BACnet Broadcast Management Device (BBMD) (BACnet)

A communications device, typically combined with a BACnet router. A BBMD forwards BACnet broadcast messages to BACnet/IP devices and other BBMDs connected to the same BACnet/IP network. Each IP subnet that is part of a BACnet/IP network must have at least one BBMD. Note there are additional restrictions when multiple BBMDs share an IP subnet.

1.4.7 BACnet/IP (BACnet)

An extension of BACnet, Annex J, defines the use of a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnets that share the same BACnet network number. See also paragraph BACNET BROADCAST MANAGEMENT DEVICE.

1.4.8 BACnet Internetwork (BACnet)

Two or more BACnet networks, connected with BACnet routers. In a BACnet Internetwork, there exists only one message path between devices.

1.4.9 BACnet Interoperability Building Blocks (BIBBs) (BACnet)

A BIBB is a collection of one or more ASHRAE 135 Services intended to define a higher level of interoperability. BIBBs are combined to build the BACnet functional requirements for a device in a specification. Some BIBBs define additional requirements (beyond requiring support for specific services) in order to achieve a level of interoperability. For example, the BIBB DS-V-A (Data Sharing-View-A), which would typically be used by a front-end, not only requires the client to support the ReadProperty Service, but also provides a list of data types (Object / Properties) which the client must be able to interpret and display for the user.

In the BIBB shorthand notation, -A is the client side and -B is the server side.

The following is a list of some BIBBs used by this or referenced Sections:	
DS-COV-A	Data Sharing-Change of Value (A side)
DS-COV-B	Data Sharing-Change of Value (B side)
NM-RC-B	Network Management-Router Configuration (B side)
DS-RP-A	Data Sharing-Read Property (A side)
DS-RP-B	Data Sharing-Read Property (B side)
DS-RPM-A	Data Sharing-Read Property Multiple (A Side)
DS-RPM-B	Data Sharing-Read Property Multiple (B Side)
DS-WP-A	Data Sharing-Write Property (A Side)
DM-TS-B	Device Management-Time Synchronization (B Side)
DM-UTC-B	Device Management-UTC Time Synchronization (B Side)
DS-WP-B	Data Sharing-Write Property (B side)
SCHED-E-B	Scheduling-External (B side)
DM-OCD-B	Device Management-Object Creation and Deletion (B side)
AE-N-I-B	Alarm and Event-Notification Internal (B Side)
AE-N-E-B	Alarm and Event-Notification External (B Side)
T-VMT-I-B	Trending-Viewing and Modifying Trends Internal (B Side)
T-VMT-E-B	Trending-Viewing and Modifying Trends External (B Side)

1.4.10 BACnet Network (BACnet)

In BACnet, a portion of the control Internetwork consisting of one or more segments connected by repeaters. Networks are separated by routers.

1.4.11 BACnet Operator Display (B-OD) (BACnet)

A basic operator interface with limited capabilities relative to a B-OWS. It is not intended to perform direct digital control. A B-OD profile could be used for LCD devices, displays affixed to BACnet devices, handheld terminals or other very simple user interfaces.

1.4.12 BACnet Segment (BACnet)

One or more physical segments interconnected by repeaters (ASHRAE 135).

1.4.13 BACnet Smart Actuator (B-SA) (BACnet)

A simple actuator device with limited resources intended for specific applications.

1.4.14 BACnet Smart Sensor (B-SS) (BACnet)

A simple sensing device with limited resources.

1.4.15 BACnet Testing Laboratories (BTL) (BACnet)

Established by BACnet International to support compliance testing and interoperability testing activities and consists of BTL Manager and the BTL Working Group (BTL-WG). BTL also publishes Implementation Guidelines.

1.4.16 BACnet Testing Laboratories (BTL) Listed (BACnet)

A device that has been listed by BACnet Testing Laboratory. Devices may be certified to a specific device profile, in which case the listing indicates that the device supports the required capabilities for that profile, or may be listed as "other".

1.4.17 Binary (All protocols)

A two-state system where an "ON" condition is represented by a high signal level and an "OFF" condition is represented by a low signal level. 'Digital' is sometimes used interchangeably with 'binary'.

1.4.18 Broadcast (BACnet)

Unlike most messages, which are intended for a specific recipient device, a broadcast message is intended for all devices on the network.

1.4.19 Building Control Network (BCN) (All protocols)

The network connecting all DDC Hardware within a building (or specific group of buildings).

1.4.20 Building Point of Connection (BPOC) (All protocols)

A FPOC for a Building Control System. (This term is being phased out of use in preference for FPOC but is still used in some specifications and criteria. When it was used, it typically referred to a piece of control hardware. The current FPOC definition typically refers instead to IT hardware.)

1.4.21 Commandable (All protocols)

See Overridable.

1.4.22 Commandable Objects (BACnet)

Commandable Objects have a Commandable Property, Priority_Array, and Relinquish_Default Property as defined in ASHRAE 135, Clause 19.2, Command Prioritization.

1.4.23 Configurable (All protocols)

A property, setting, or value is configurable if it can be changed via hardware settings on the device, via the use of engineering software or over the control network from the front end, and is retained through (after) loss of power.

In a BACnet system, a property, setting, or value is configurable if it can be changed via one or more of:
1) via BACnet services (including proprietary BACnet services)
2) via hardware settings on the device

Note this is more stringent than the ASHRAE 135 definition.

1.4.24 Control Logic Diagram (All protocols)

A graphical representation of control logic for multiple processes that make up a system.

1.4.25 Device (BACnet)

A Digital Controller that contains a BACnet Device Object and uses BACnet to communicate with other devices.

1.4.26 Device Object (BACnet)

Every BACnet device requires one Device Object, whose properties represent the network visible properties of that device. Every Device Object requires a unique Object Identifier number on the BACnet Internetwork. This number is often referred to as the device instance or device ID.

1.4.27 Device Profile (BACnet)

A collection of BIBBs determining minimum BACnet capabilities of a device, defined in ASHRAE 135. Standard device profiles include BACnet Advanced Workstations (B-AWS), BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC), BACnet Application Specific Controllers (B-ASC), BACnet Smart Actuator (B-SA), and BACnet Smart Sensor (B-SS).

1.4.28 Digital Controller (All protocols)

An electronic controller, usually with internal programming logic and digital and analog input/output capability, which performs control functions.

1.4.29 Direct Digital Control (DDC) (All protocols)

Digital controllers performing control logic. Usually the controller directly senses physical values, makes control decisions with internal

programs, and outputs control signals to directly operate switches, valves, dampers, and motor controllers.

1.4.30 Field Point of Connection (FPOC) (All protocols)

The FPOC is the point of connection between the UMCS IP Network and the field control network (either an IP network, a non-IP network, or a combination of both). The hardware at this location which provides the connection is generally an IT device such as a switch, IP router, or firewall.

In general, the term "FPOC Location" means the place where this connection occurs, and "FPOC Hardware" means the device that provides the connection. Sometimes the term "FPOC" is used to mean either and its actual meaning (i.e. location or hardware) is determined by the context in which it is used.

1.4.31 Gateway (All protocols)

A device that translates from one protocol application data format to another. Devices that change only the transport mechanism of the protocol - "translating" from TP/FT-10 to Ethernet/IP or from BACnet MS/TP to BACnet over IP for example - are not gateways as the underlying data format does not change. Gateways are also called Communications Bridges or Protocol Translators.

1.4.32 IEEE 802.3 Ethernet (All protocols)

A family of local-area-network technologies providing high-speed networking features over various media, typically Cat 5, 5e or Cat 6 twisted pair copper or fiber optic cable.

1.4.33 Internet Protocol (IP, TCP/IP, UDP/IP) (All protocols)

A communication method, the most common use is the World Wide Web. At the lowest level, it is based on Internet Protocol (IP), a method for conveying and routing packets of information over various LAN media. Two common protocols using IP are User Datagram Protocol (UDP) and Transmission Control Protocol (TCP). UDP conveys information to well-known "sockets" without confirmation of receipt. TCP establishes connections, also known as "sessions", which have end-to-end confirmation and guaranteed sequence of delivery.

1.4.34 Input/Output (I/O) (All protocols)

Physical inputs and outputs to and from a device, although the term sometimes describes network or "virtual" inputs or outputs. See also "Points".

1.4.35 I/O Expansion Unit (All protocols)

An I/O expansion unit provides additional point capacity to a digital controller

1.4.36 IP subnet (All protocols)

A group of devices which share a defined range IP addresses. Devices on a

common IP subnet can share data (including broadcasts) directly without the need for the traffic to traverse an IP router.

1.4.37 Local-Area Network (LAN) (All protocols)

A communication network that spans a limited geographic area and uses the same basic communication technology throughout.

1.4.38 Local Display Panels (LDPs) (All protocols)

A DDC Hardware with a display and navigation buttons, and must provide display and adjustment of points as shown on the Points Schedule and as indicated.

1.4.39 MAC Address (All protocols)

Media Access Control address. The physical device address that identifies a device on a Local Area Network.

1.4.40 Master-Slave/Token-Passing (MS/TP) (BACnet)

Data link protocol as defined by the BACnet standard. Multiple speeds (data rates) are permitted by the BACnet MS/TP standard.

1.4.41 Monitoring and Control (M&C) Software (All protocols)

The UMCS 'front end' software which performs supervisory functions such as alarm handling, scheduling and data logging and provides a user interface for monitoring the system and configuring these functions.

1.4.42 Network Number (BACnet)

A site-specific number assigned to each network. This network number must be unique throughout the BACnet Internetwork.

1.4.43 Object (BACnet)

An ASHRAE 135 Object. The concept of organizing BACnet information into standard components with various associated Properties. Examples include Analog Input objects and Binary Output objects.

1.4.44 Object Identifier (BACnet)

A grouping of two Object properties: Object Type (e.g. Analog Value, Schedule, etc.) and Object Instance (in this case, a number). Object Identifiers must be unique within a device.

1.4.45 Object Instance (BACnet)

See paragraph OBJECT IDENTIFIER

1.4.46 Object Properties (BACnet)

Attributes of an object. Examples include present value and high limit properties of an analog input object. Properties are defined in ASHRAE 135; some are optional and some are required. Objects are controlled by reading from and writing to object properties.

1.4.47 Operator Configurable (All protocols)

Operator configurable values are values that can be changed from a single common front end user interface across multiple vendor systems.

For non Niagara-based BACnet systems, a property, setting, or value in a device is Operator Configurable when it is Configurable and is either:

a. a Writable Property of a Standard BACnet Object; or

b. a Property of a Standard BACnet Object that is Writable when Out_Of_Service is TRUE and Out_Of_Service is Writable.

1.4.48 Override (All protocols)

Changing the value of a point outside of the normal sequence of operation where the change has priority over the sequence and where there is a mechanism for releasing the change such that the point returns to the normal value. Overrides persist until released or overridden at the same or higher priority but are not required to persist through a loss of power. Overrides are often used by operators to change values, and generally originate at a user interface (workstation or local display panel).

1.4.49 Packaged Equipment (All protocols)

Packaged equipment is a single piece of equipment provided by a manufacturer in a substantially complete and operable condition, where the controls (DDC Hardware) are factory installed, and the equipment is sold and shipped from the manufacturer as a single entity. Disassembly and reassembly of a large piece of equipment for shipping does not prevent it from being packaged equipment. Package units may require field installation of remote sensors. Packaged equipment is also called a "packaged unit".

Note industry may use the term "Packaged System" to mean a collection of equipment that is designed to work together where each piece of equipment is packaged equipment and there is a network that connects the equipment together. A "packaged system" of this type is NOT packaged equipment; it is a collection of packaged equipment, and each piece of equipment must individually meet specification requirements.

1.4.50 Packaged Unit (All protocols)

See packaged equipment.

1.4.51 Performance Verification Test (PVT) (All protocols)

The procedure for determining if the installed BAS meets design criteria prior to final acceptance. The PVT is performed after installation, testing, and balancing of mechanical systems. Typically the PVT is performed by the Contractor in the presence of the Government.

1.4.52 Physical Segment (BACnet)

A single contiguous medium to which BACnet devices are attached (ASHRAE 135).

1.4.53 Polling (All protocols)

A device periodically requesting data from another device.

1.4.54 Points (All protocols)

Physical and virtual inputs and outputs. See also paragraph INPUT/OUTPUT (I/O).

1.4.55 Proportional, Integral, and Derivative (PID) Control Loop (All protocols)

Three parameters used to control modulating equipment to maintain a setpoint. Derivative control is often not required for HVAC systems (leaving "PI" control).

1.4.56 Proprietary (BACnet)

Within the context of BACnet, any extension of or addition to object types, properties, PrivateTransfer services, or enumerations specified in ASHRAE 135. Objects with Object_Type values of 128 and above are Proprietary Objects. Properties with Property_Identifier of 512 and above are proprietary Properties.

1.4.57 Protocol Implementation Conformance Statement (PICS) (BACnet)

A document, created by the manufacturer of a device, which describes which portions of the BACnet standard may be implemented by a given device. ASHRAE 135 requires that all ASHRAE 135 devices have a PICS, and also defines a minimum set of information that must be in it. A device as installed for a specific project may not implement everything in its PICS.

1.4.58 Repeater (All protocols)

A device that connects two control network segments and retransmits all information received on one side onto the other.

1.4.59 Router (All protocols)

A device that connects two ASHRAE 135 networks and controls traffic between the two by retransmitting signals received from one side onto the other based on the signal destination. Routers are used to subdivide a BACnet internetwork and to limit network traffic.

1.4.60 Segment (All protocols)

A 'single' section of a control network that contains no repeaters or routers. There is generally a limit on the number of devices on a segment, and this limit is dependent on the topology/media and device type.

1.4.61 Standard BACnet Objects (BACnet)

Objects with Object_Type values below 128 and specifically enumerated in Clause 21 of ASHRAE 135. Objects which are not proprietary. See paragraph PROPRIETARY.

1.4.62 Standard BACnet Properties (BACnet)

Properties with Property_Identifier values below 512 and specifically enumerated in Clause 21 of ASHRAE 135. Properties which are not proprietary. See Proprietary.

1.4.63 Standard BACnet Services (BACnet)

ASHRAE 135 services other than ConfirmedPrivateTransfer or UnconfirmedPrivateTransfer. See paragraph PROPRIETARY.

1.4.64 UMCS (All protocols)

UMCS stands for Utility Monitoring and Control System. The term refers to all components by which a project site monitors, manages, and controls real-time operation of HVAC and other building systems. These components include the UMCS "front-end" and all field building control systems connected to the front-end. The front-end consists of Monitoring and Control Software (user interface software), browser-based user interfaces and network infrastructure.

The network infrastructure (the "UMCS Network"), is an IP network connecting multiple building or facility control networks to the Monitoring and Control Software.

1.4.65 UMCS Network (All protocols)

The UMCS Network connects multiple building or facility control networks to the Monitoring and Control Software.

1.4.66 Writable Property (BACnet)

A Property is Writable when it can be changed through the use of one or more of the WriteProperty services defined in ASHRAE 135, Clause 15 regardless of the value of any other Property. Note that in the ASHRAE 135 standard, some Properties may be writable when the Out of Service Property is TRUE; for purposes of this Section, Properties that are only writable when the Out of Service Property is TRUE are not considered to be Writable.

1.5 PROJECT SEQUENCING

TABLE II: PROJECT SEQUENCING lists the sequencing of submittals as specified in paragraph SUBMITTALS (denoted by an 'S' in the 'TYPE' column) and activities as specified in PART 3 EXECUTION (denoted by an 'E' in the 'TYPE' column). TABLE II does not specify overall project milestone and completion dates.

a. Sequencing for Submittals: The sequencing specified for submittals is the deadline by which the submittal must be initially submitted to the Government. Following submission there will be a Government review period as specified in Section 01 33 00 SUBMITTAL PROCEDURES. If the submittal is not accepted by the Government, revise the submittal and resubmit it to the Government within 14 days of notification that the submittal has been rejected. Upon resubmittal there will be an additional Government review period. If the submittal is not accepted the process repeats until the submittal is accepted by the Government.

b. Sequencing for Activities: The sequencing specified for activities

indicates the earliest the activity may begin.

c. Abbreviations: In TABLE II the abbreviation AAO is used for 'after approval of' and 'ACO' is used for 'after completion of'.

TABLE II. PROJECT SEQUENCING

ITEM #	TYPE	DESCRIPTION	SEQUENCING (START OF ACTIVITY OR DEADLINE FOR SUBMITTAL)
1	S	Existing Conditions Report	
2	S	DDC Contractor Design Drawings	
3	S	Manufacturer's Product Data	
4	S	Pre-construction QC Checklist	
5	E	Install Building Control System	AAO #1 thru #4
6	E	Start-Up and Start-Up Testing	ACO #5
7	S	Post-Construction QC Checklist	ACO #6
8	S	Programming Software Configuration Software	ACO #6
9	S	Draft As-Built Drawings	ACO #6
10	S	Start-Up Testing Report	ACO #6
11	S	PVT Procedures	before schedule start of #12 and AAO #10
12	S,E	PVT Testing Activities	As indicated in PART 3 of this Section

TABLE II. PROJECT SEQUENCING			
ITEM #	TYPE	DESCRIPTION	SEQUENCING (START OF ACTIVITY OR DEADLINE FOR SUBMITTAL)
13	S	PVT Report	As indicated in PART 3 of this Section
14	S	Controller Application Programs Controller Configuration Settings	AAO #13
15	S	Final As-Built Drawings	AAO #13
16	S	O&M Instructions	AAO #15
17	S	Training Documentation	AAO #10 and 14 days before scheduled start of #18
18	E	Training	AAO #16 and #17
19	S	Closeout QC Checklist	ACO #18

1.6 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

DDC Contractor Design Drawings

Draft As-Built Drawings

Final As-Built Drawings

SD-03 Product Data

Programming Software

Controller Application Programs

Configuration Software

Controller Configuration Settings

Manufacturer's Product Data

SD-05 Design Data

Boiler Or Chiller Plant Gateway Request

SD-06 Test Reports

Existing Conditions Report

Pre-Construction Quality Control (QC) Checklist

Post-Construction Quality Control (QC) Checklist

Start-Up Testing Report

Control Contractor’s Performance Verification Testing Plan

Equipment Supplier’s Performance Verification Testing Plan

Endurance Testing Results

Performance Verification Test Report

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions

Training Documentation

SD-11 Closeout Submittals

Enclosure Keys

Password Summary Report

Closeout Quality Control (QC) Checklist

1.7 DATA PACKAGE AND SUBMITTAL REQUIREMENTS

Technical data packages consisting of technical data and computer software (meaning technical data which relates to computer software) which are specifically identified in this project and which may be defined/required in other specifications must be delivered strictly in accordance with the CONTRACT CLAUSES and in accordance with the Contract Data Requirements List, DD Form 1423. Data delivered must be identified by reference to the particular specification paragraph against which it is furnished. All submittals not specified as technical data packages are considered 'shop drawings' under the Federal Acquisition Regulation Supplement (FARS) and must contain no proprietary information and be delivered with unrestricted rights.

1.8 SOFTWARE FOR DDC HARDWARE AND GATEWAYS

Provide all software related to the programming and configuration of DDC Hardware and Gateways as indicated. License all Software to the project site. The term "controller" as used in these requirements means both DDC Hardware and Gateways.

1.8.1 Configuration Software

For each type of controller, provide the configuration tool software in accordance with Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS. Submit hard copies of the software user manuals for each software with the software submittal.

Submit Configuration Software on CD-ROM as a Technical Data Package. Submit 2 hard copies of the software user manual for each piece of software.

1.8.2 Controller Configuration Settings

For each controller, provide copies of the installed configuration settings as source code compatible with the configuration tool software for that controller in accordance with Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

Submit Controller Configuration Settings on CD-ROM as a Technical Data Package. Include on the CD-ROM a list or table of contents clearly indicating which files are associated with each device. Submit 2 copies of the Controller Configuration Settings CD-ROM.

1.8.3 Programming Software

For each type of programmable controller, provide the programming software in accordance with Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS. Submit hard copies of software user manuals for each software with the software submittal.

Submit Programming Software on CD-ROM as a Technical Data Package. Submit 2 hard copies of the software user manual for each piece of software.

1.8.4 Controller Application Programs

For each programmable controller, provide copies of the application program as source code compatible with the programming software for that controller in accordance with Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

Submit Controller Application Programs on CD-ROM as a Technical Data Package. Include on the CD-ROM a list or table of contents clearly indicating which application program is associated with each device. Submit 2 copies of the Controller Application Programs CD-ROM.

1.9 BOILER OR CHILLER PLANT GATEWAY REQUEST

If requesting the use of a gateway to a boiler or chiller plant as indicated in paragraph Proprietary Systems Exempted From Open Protocol Requirements, submit a Boiler or Chiller Plant Gateway Request describing the configuration of the boilers or chillers including model numbers for equipment and controllers, the sequence of operation for the units, and a justification for the need to operate the units on a shared non-BACnet network.

1.10 QUALITY CONTROL CHECKLISTS

The QC Checklist for BACnet Systems in APPENDIX A of this Section must be

completed by the Contractor's Chief Quality Control (QC) Representative and submitted as indicated.

The QC Representative must verify each item indicated and initial in the space provided to indicate that the requirement has been met. The QC Representative must sign and date the Checklist prior to submission to the Government.

1.10.1 Pre-Construction Quality Control (QC) Checklist

Complete items indicated as Pre-Construction QC Checklist items in the QC Checklist. Submit four copies of the Pre-Construction QC Checklist.

1.10.2 Post-Construction Quality Control (QC) Checklist

Complete items indicated as Post-Construction QC Checklist items in the QC Checklist. Submit four copies of the Post-Construction QC Checklist.

1.10.3 Closeout Quality Control (QC) Checklist

Complete items indicated as Closeout QC Checklist items in the QC Checklist. Submit four copies of the Closeout QC Checklist.

PART 2 PRODUCTS

Provide products meeting the requirements of Section 23 09 13.00 22 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC, Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS for BACnet or Niagara BACnet systems, other referenced Sections, and this Section.

2.1 GENERAL PRODUCT REQUIREMENTS

Units of the same type of equipment must be products of a single manufacturer. Each major component of equipment must have the manufacturer's name and address, and the model and serial number in a conspicuous place. Materials and equipment must be standard products of a manufacturer regularly engaged in the manufacturing of these and similar products. The standard products must have been in a satisfactory commercial or industrial use for two years prior to use on this project. The two year use must include applications of equipment and materials under similar circumstances and of similar size. DDC Hardware not meeting the two-year field service requirement is acceptable provided it has been successfully used by the Contractor in a minimum of two previous projects. The equipment items must be supported by a service organization. Items of the same type and purpose must be identical, including equipment, assemblies, parts and components.

2.2 PRODUCT DATA

Provide manufacturer's product data sheets documenting compliance with product specifications for each product provided under Section 23 09 13.00 22 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC, Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS, or this Section. Provide product data for all products in a single indexed compendium, organized by product type.

For all BACnet hardware: for each manufacturer, model and version (revision) of DDC Hardware provide the Protocol Implementation Conformance

Statement (PICS) in accordance with Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

Submit Manufacturer's Product Data on CD-ROM.

2.3 OPERATION ENVIRONMENT

Unless otherwise specified, provide products rated for continuous operation under the following conditions:

a. Pressure: Pressure conditions normally encountered in the installed location.

b. Vibration: Vibration conditions normally encountered in the installed location.

c. Temperature:

(1) Products installed indoors: Ambient temperatures in the range of 32 to 112 degrees F and temperature conditions outside this range normally encountered at the installed location.

(2) Products installed outdoors or in unconditioned indoor spaces: Ambient temperatures in the range of -35 to +151 degrees F and temperature conditions outside this range normally encountered at the installed location.

d. Humidity: 10 to 95 percent relative humidity, noncondensing and humidity conditions outside this range normally encountered at the installed location.

2.4 WIRELESS CAPABILITY

For products incorporating any wireless capability (including but not limited to radio frequency (RF), infrared and optical), provide products for which wireless capability can be permanently disabled at the device. Optical and infrared capabilities may be disabled via a permanently affixed opaque cover plate.

2.5 ENCLOSURES

Enclosures supplied as an integral (pre-packaged) part of another product are acceptable. Provide two Enclosure Keys for each lockable enclosure on a single ring per enclosure with a tag identifying the enclosure the keys operate. Provide enclosures meeting the following minimum requirements:

2.5.1 Outdoors

For enclosures located outdoors, provide enclosures meeting NEMA 250 Type 3 requirements.

2.5.2 Mechanical and Electrical Rooms

For enclosures located in mechanical or electrical rooms, provide enclosures meeting NEMA 250 Type 2 requirements.

2.5.3 Other Locations

For enclosures in other locations including but not limited to occupied

spaces, above ceilings, and in plenum returns, provide enclosures meeting NEMA 250 Type 1 requirements.

2.6 WIRE AND CABLE

Provide wire and cable meeting the requirements of NFPA 70 and NFPA 90A in addition to the requirements of this specification and referenced specifications.

2.6.1 Terminal Blocks

For terminal blocks which are not integral to other equipment, provide terminal blocks which are insulated, modular, feed-through, clamp style with recessed captive screw-type clamping mechanism, suitable for DIN rail mounting, and which have enclosed sides or end plates and partition plates for separation.

2.6.2 Control Wiring for Binary Signals

For Control Wiring for Binary Signals, provide 18 AWG copper or thicker wire rated for 300-volt service.

2.6.3 Control Wiring for Analog Signals

For Control Wiring for Analog Signals, provide 18 AWG or thicker, copper, single- or multiple-twisted wire meeting the following requirements:

a. minimum 2 inch lay of twist

b. 100 percent shielded pairs

c. at least 300-volt insulation

d. each pair has a 20 AWG tinned-copper drain wire and individual overall pair insulation

e. cables have an overall aluminum-polyester or tinned-copper cable-shield tape, overall 20 AWG tinned-copper cable drain wire, and overall cable insulation.

2.6.4 Power Wiring for Control Devices

For 24-volt circuits, provide insulated copper 18 AWG or thicker wire rated for 300 VAC service. For 120-volt circuits, provide 14 AWG or thicker stranded copper wire rated for 600-volt service.

2.6.5 Transformers

Provide UL 5085-3 approved transformers. Select transformers sized so that the connected load is no greater than 80 percent of the transformer rated capacity.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

3.1.1 Existing Conditions Survey

Perform a field survey, including testing and inspection of the equipment

to be controlled and submit an Existing Conditions Report documenting the current status and its impact on the Contractor's ability to meet this specification. For those items considered nonfunctional, document the deficiency in the report including explanation of the deficiencies and estimated costs to correct the deficiencies. As part of the report, define the scheduled need date for connection to existing equipment. Make written requests and obtain Government approval prior to disconnecting any controls and obtaining equipment downtime.

Submit four copies of the Existing Conditions Report.

3.1.2 Existing Equipment Downtime

Make written requests and obtain Government approval prior to disconnecting any controls and obtaining equipment downtime.

3.1.3 Existing Control System Devices

Inspect, calibrate, and adjust as necessary to place in proper working order all existing devices which are to be reused.

3.2 INSTALLATION

Fully install and test the control system in accordance Section 23 09 13.00 22 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC, Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS for BACnet or Niagara BACnet systems, and this Section.

3.2.1 Dielectric Isolation

Provide dielectric isolation where dissimilar metals are used for connection and support. Install control system in a matter that provides clearance for control system maintenance by maintaining access space required to calibrate, remove, repair, or replace control system devices. Install control system such that it does not interfere with the clearance requirements for mechanical and electrical system maintenance.

3.2.2 Penetrations in Building Exterior

Make all penetrations through and mounting holes in the building exterior watertight.

3.2.3 Device Mounting Criteria

Install devices in accordance with the manufacturer's recommendations and as indicated and shown. Provide a weathershield for all devices installed outdoors. Provide clearance for control system maintenance by maintaining access space required to calibrate, remove, repair, or replace control system devices. Provide clearance for mechanical and electrical system maintenance; do not not interfere with the clearance requirements for mechanical and electrical system maintenance.

3.2.4 Labels and Tags

Key all labels and tags to the unique identifiers shown on the As-Built drawings. For labels exterior to protective enclosures provide engraved plastic labels mechanically attached to the enclosure or DDC Hardware. Labels inside protective enclosures may be attached using adhesive, but must not be hand written. For tags, provide plastic or metal tags

mechanically attached directly to each device or attached by a metal chain or wire.

a. Label all Enclosures and DDC Hardware.

b. Tag Airflow measurement arrays (AFMA) with flow rate range for signal output range, duct size, and pitot tube AFMA flow coefficient.

c. Tag duct static pressure taps at the location of the pressure tap

3.2.5 Surge Protection

3.2.5.1 Power-Line Surge Protection

Protect equipment connected to AC circuits to withstand power-line surges in accordance with IEEE C62.41. Do not use fuses for surge protection.

3.2.5.2 Surge Protection for Transmitter and Control Wiring

Protect DDC hardware against or provided DDC hardware capable of withstanding surges induced on control and transmitter wiring installed outdoors and as shown. Protect equipment against the following two waveforms:

a. A waveform with a 10-microsecond rise time, a 1000-microsecond decay time and a peak current of 60 amps.

b. A waveform with an 8-microsecond rise time, a 20-microsecond decay time and a peak current of 500 amperes.

3.2.6 Basic Cybersecurity Requirements

3.2.6.1 Passwords

For all devices with a password, change the password from the default password. Do not use the same password for more than one device. Coordinate selection of passwords with MCAS Cherry Point. Provide a Password Summary Report documenting the password for each device and describing the procedure to change the password for each device.

Provide two hardcopies of the Password Summary Report, each copy in its own sealed envelope.

3.2.6.2 Wireless Capability

Unless otherwise indicated, disable wireless capability (including but not limited to radio frequency (RF), infrared and optical) for all devices with wireless capability. Optical and infrared capabilities may be disabled via a permanently affixed opaque cover plate. Password protecting a wireless connections does not meet this requirement; the wireless capability must be disabled.

3.2.6.3 IP Network Physical Security

Install all IP Network media in conduit. Install all IP devices including but not limited to IP-enabled DDC hardware and IP Network Hardware in lockable enclosures.

3.3 DRAWINGS AND CALCULATIONS

Provide drawings in the form and arrangement indicated and shown. Use the same abbreviations, symbols, nomenclature and identifiers shown. Assign a unique identifier as shown to each control system element on a drawing. When packaging drawings, group schedules by system. When space allows, it is permissible to include multiple schedules for the same system on a single sheet. Except for drawings covering all systems, do not put information for different systems on the same sheet.

Submit hardcopy drawings on ISO A1 34 by 22 inchesorA3 17 by 11 inches sheets, and electronic drawings in PDF and in AutoCAD format. In addition, submit electronic drawings in editable Excel format for all drawings that are tabular, including but not limited to the Point Schedule and Equipment Schedule.

a. Submit DDC Contractor Design Drawings consisting of each drawing indicated with pre-construction information depicting the intended control system design and plans. Submit DDC Contractor Design Drawings as a single complete package: 6 hard copies and 2 copies on CD-ROM.

b. Submit Draft As-Built Drawings consisting of each drawing indicated updated with as-built data for the system prior to PVT. Submit Draft As-Built Drawings as a single complete package: 6 hard copies and 2 copies on CD-ROM.

c. Submit Final As-Built Drawings consisting of each drawing indicated updated with all final as-built data. Final As-Built Drawings as a single complete package: 6 hard copies and 2 copies on CD-ROM.

3.3.1 Sample Drawings

Sample drawings in electronic format are available at the Whole Building Design Guide page for this section:
http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-23-09-00
These drawings may prove useful in demonstrating expected drawing formatting and example content and are provided for illustrative purposes only. Note that these drawings do not meet the content requirements of this Section and must be completed to meet project requirements.

3.3.2 Drawing Index and Legend

Provide an HVAC Control System Drawing Index showing the name and number of the building, military site, State or other similar designation, and Country. In the Drawing Index, list all Contractor Design Drawings, including the drawing number, sheet number, drawing title, and computer filename when used. In the Design Drawing Legend, show and describe all symbols, abbreviations and acronyms used on the Design Drawings. Provide a single Index and Legend for the entire drawing package.

3.3.3 Thermostat and Occupancy Sensor Schedule

Provide a thermostat and occupancy sensor schedule containing each thermostat's unique identifier, room identifier and control features and functions as shown. Provide a single thermostat and occupancy sensor schedule for the entire project.

3.3.4 Valve Schedule

Provide a valve schedule containing each valve's unique identifier, size, flow coefficient Kv (Cv), pressure drop at specified flow rate, spring range, positive positioner range, actuator size, close-off pressure to torque data, dimensions, and access and clearance requirements data. In the valve schedule include actuator selection data supported by calculations of the force required to move and seal the valve, access and clearance requirements. Provide a single valve schedule for the entire project.

3.3.5 Damper Schedule

Provide a damper schedule containing each damper's unique identifier, type (opposed or parallel blade), nominal and actual sizes, orientation of axis and frame, direction of blade rotation, actuator size and spring ranges, operation rate, positive positioner range, location of actuators and damper end switches, arrangement of sections in multi-section dampers, and methods of connecting dampers, actuators, and linkages. Include the AMCA 511 maximum leakage rate at the operating static-pressure differential for each damper in the Damper Schedule. Provide a single damper schedule for the entire project.

3.3.6 Project Summary Equipment Schedule

Provide a project summary equipment schedule containing the manufacturer, model number, part number and descriptive name for each control device, hardware and component provided under this specification. Provide a single project equipment schedule for the entire project.

3.3.7 Equipment Schedule

Provide system equipment schedules containing the unique identifier, manufacturer, model number, part number and descriptive name for each control device, hardware and component provided under this specification. Provide a separate equipment schedule for each HVAC system.

3.3.8 Occupancy Schedule

Provide an occupancy schedule drawing containing the same fields as the occupancy schedule Contract Drawing with Contractor updated information. Provide a single occupancy schedule for the entire project.

3.3.9 DDC Hardware Schedule

Provide a single DDC Hardware Schedule for the entire project and including following information for each device.

3.3.9.1 DDC Hardware Identifier

The Unique DDC Hardware Identifier for the device.

3.3.9.2 HVAC System

The system "name" used to identify a specific system (the name used on the system schematic drawing for that system).

3.3.9.3 BACnet Device Information

3.3.9.3.1 Device Object Identifier

The Device Object Identifier: The Object_Identifier of the Device Object

3.3.9.3.2 Network Number

The Network Number for the device.

3.3.9.3.3 MAC Address

The MAC Address for the device

3.3.9.3.4 BTL Listing

The BTL Listing of the device. If the device is listed under multiple BTL Profiles, indicate the profile that matches the use and configuration of the device as installed.

3.3.9.3.5 Proprietary Services Information

If the device uses non-standard ASHRAE 135 services as defined and permitted in Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS, indicate that the device uses non-standard services and include a description of all non-standard services used. Describe usage and content such that a device from another vendor can interoperate with the device using the non-standard service. Provide descriptions with sufficient detail to allow a device from a different manufacturer to be programmed to both read and write the non-standard service request:

a. read: interpret the data contained in the non-standard service and;

b. write: given similar data, generate the appropriate non-standard service request.

3.3.9.3.6 Alarming Information

Indicate whether the device is used for alarm generation, and which types of alarm generation the device implements: intrinsic, local algorithmic, remote algorithmic.

3.3.9.3.7 Scheduling Information

Indicate whether the device is used for scheduling.

3.3.9.3.8 Trending Information

Indicate whether the device is used for trending, and indicate if the device is used to trend local values, remote values, or both.

3.3.10 Points Schedule

Provide a Points Schedule in tabular form for each HVAC system, with the indicated columns and with each row representing a hardware point, network point or configuration point in the system.

a. When a Points Schedule was included in the Contract Drawing package, use the same fields as the Contract Drawing with updated information in addition to the indicated fields.

b. When Point Schedules are included in the contract package, items requiring contractor verification or input have been shown in angle brackets ("<" and ">"), such as <___> for a required entry or <value> for a value requiring confirmation. Complete all items in brackets as well as any blank cells. Do not modify values which are not in brackets without approval.

Points Schedule Columns must include:

3.3.10.1 Point Name

The abbreviated name for the point using the indicated naming convention.

3.3.10.2 Description

A brief functional description of the point such as "Supply Air Temperature".

3.3.10.3 DDC Hardware Identifier

The Unique DDC Hardware Identifier shown on the DDC Hardware Schedule and used across all drawings for the DDC Hardware containing the point.

3.3.10.4 Settings

The value and units of any setpoints, configured setpoints, configuration parameters, and settings related to each point.

3.3.10.5 Range

The range of values, including units, associated with the point, including but not limited to a zone temperature setpoint adjustment range, a sensor measurement range, occupancy values for an occupancy input, or the status of a safety.

3.3.10.6 Input or Output (I/O) Type

The type of input or output signal associated with the point. Use the following abbreviations for entries in this column:

a. AI: The value comes from a hardware (physical) Analog Input

b. AO: The value is output as a hardware (physical) Analog Output

c. BI: The value comes from a hardware (physical) Binary Input

d. BO: The value is output as a hardware (physical) Binary Output

e. PULSE: The value comes from a hardware (physical) Pulse Accumulator Input

f. NET-IN: The value is provided from the network (generally from another device). Use this entry only when the value is received from another device as part of scheduling or as part of a sequence of operation, not when the value is received on the network for

supervisory functions such as trending, alarming, override or display at a user interface.

g. NET-OUT: The value is provided to another controller over the network. Use this entry only when the value is transmitted to another device as part of scheduling or as part of a sequence of operation, not when the value is transmitted on the network for supervisory functions such as trending, alarming, override or display at a user interface.

3.3.10.7 Object and Property Information

The Object Type and Instance Number for the Object associated with the point. If the value of the point is not in the Present_Value Property, then also provide the Property ID for the Property containing the value of the point. Any point that is displayed at the front end or on an LDP, is trended, is used by another device on the network, or has an alarm condition must be documented here.

3.3.10.8 Network Data Exchange Information (Gets Data From, Sends Data To)

Provide the DDC Hardware Identifier of other DDC Hardware the point is shared with.

3.3.10.9 Override Information (Object Type and Instance Number)

For each point requiring an Override, indicate if the Object for the point is Commandable or, if the use of a separate Object was specifically approved by the Contracting Officer, provide the Object Type and Instance Number of the Object to be used in overriding the point.

3.3.10.10 Trend Object Information

For each point requiring a trend, indicate if the trend is Local or Remote, the trend Object type and the trend Object instance number. For remote trends provide the DDC Hardware Identifier for the device containing the trend Object in the Points Schedule notes.

3.3.10.11 Alarm Information

Indicate the Alarm Generation Type, Event Enrollment Object Instance Number, and Notification Class Object Instance Number for each point requiring an alarm. (Note that not all alarms will have Event Enrollment Objects.)

3.3.10.12 Configuration Information

Indicate the means of configuration associated with each point.

a. For Operator Configurable Points indicate BACnet Object and Property information (Name, Type, Identifiers) containing the configurable value. Indicate whether the property is writable always, or only when Out_Of_Service is TRUE.

b. For Configurable Points indicate the BACnet Object and Property information as for Operator Configurable points, or identification of the configurable settings from within the engineering software for the

device or identification of the hardware settings on the device.

3.3.11 Riser Diagram

The Riser Diagram of the Building Control Network may be in tabular form, and must show all DDC Hardware and all Network Hardware, including network terminators. For each item, provide the unique identifier, common descriptive name, physical sequential order (previous and next device on the network), room identifier and location within room. A single riser diagram must be submitted for the entire system.

3.3.12 Control System Schematics

Provide control system schematics in the same form as the control system schematic Contract Drawing with Contractor updated information. Provide a control system schematic for each HVAC system.

3.3.13 Sequences of Operation Including Control Logic Diagrams

Provide HVAC control system sequence of operation and control logic diagrams in the same format as the Contract Drawings. Within these drawings, refer to devices by their unique identifiers. Submit sequences of operation and control logic diagrams for each HVAC system

3.3.14 Controller, Motor Starter and Relay Wiring Diagram

Provide controller wiring diagrams as functional wiring diagrams which show the interconnection of conductors and cables to each controller and to the identified terminals of input and output devices, starters and package equipment. Show necessary jumpers and ground connections and the labels of all conductors. Identify sources of power required for control systems and for packaged equipment control systems back to the panel board circuit breaker number, controller enclosures, magnetic starter, or packaged equipment control circuit. Show each power supply and transformer not integral to a controller, starter, or packaged equipment. Show the connected volt-ampere load and the power supply volt-ampere rating. Provide wiring diagrams for each HVAC system.

3.4 CONTROLLER TUNING

Tune each controller in a manner consistent with that described in the ASHRAE FUN IP and in the manufacturer's instruction manual. Tuning must consist of adjustment of the proportional, integral, and where applicable, the derivative (PID) settings to provide stable closed-loop control. Each loop must be tuned while the system or plant is operating at a high gain (worst case) condition, where high gain can generally be defined as a low-flow or low-load condition. Upon final adjustment of the PID settings, in response to a change in controller setpoint, the controlled variable must settle out at the new setpoint with no more than two (2) oscillations above and below setpoint. Upon settling out at the new setpoint the controller output must be steady. With the exception of naturally slow processes such as zone temperature control, the controller must settle out at the new setpoint within five (5) minutes. Set the controller to its correct setpoint and record and submit the final PID configuration settings with the O&M Instructions and on the associated Points Schedule.

3.5 START-UP

3.5.1 Start-Up Test

Perform the following startup tests for each control system to ensure that the described control system components are installed and functioning per this specification.

Adjust, calibrate, measure, program, configure, set the time schedules, and otherwise perform all necessary actions to ensure that the systems function as indicated and shown in the sequence of operation and other contract documents.

3.5.1.1 Systems Check

An item-by-item check must be performed for each HVAC system

3.5.1.1.1 Step 1 - System Inspection

With the system in unoccupied mode and with fan hand-off-auto switches in the OFF position, verify that power and main air are available where required and that all output devices are in their failsafe and normal positions. Inspect each local display panel and each M&C Client to verify that all displays indicate shutdown conditions.

3.5.1.1.2 Step 2 - Calibration Accuracy Check

Perform a two-point accuracy check of the calibration of each HVAC control system sensing element and transmitter by comparing the value from the test instrument to the network value provided by the DDC Hardware. Use digital indicating test instruments, such as digital thermometers, motor-driven psychrometers, and tachometers. Use test instruments with accuracy at least twice as accurate as the specified sensor accuracy and with calibration traceable to National Institute of Standards and Technology standards. Check one the first check point in the bottom one-third of the sensor range, and the second in the top one-third of the sensor range. Verify that the sensing element-to-DDC readout accuracies at two points are within the specified product accuracy tolerances, and if not recalibrate or replace the device and repeat the calibration check.

3.5.1.1.3 Step 3 - Actuator Range Check

With the system running, apply a signal to each actuator through the DDC Hardware controller. Verify proper operation of the actuators and positioners for all actuated devices and record the signal levels for the extreme positions of each device. Vary the signal over its full range, and verify that the actuators travel from zero stroke to full stroke within the signal range. Where applicable, verify that all sequenced actuators move from zero stroke to full stroke in the proper direction, and move the connected device in the proper direction from one extreme position to the other. For valve actuators and damper actuators, perform the actuator range check under normal system pressures.

3.5.1.2 Weather Dependent Test

Perform weather dependent test procedures in the appropriate climatic season.

3.5.2 Start-Up Testing Report

Submit 4 copies of the Start-Up Testing Report. The report may be submitted as a Technical Data Package documenting the results of the tests performed and certifying that the system is installed and functioning per this specification, and is ready for the Performance Verification Test (PVT).

3.6 PERFORMANCE VERIFICATION TESTING

3.6.1 General

PVT testing must demonstrate compliance of controls work with contract document requirements and must be performed by the Controls Contractor and Equipment Suppliers. No less than 14 calendar days prior to start of controls system installation, meet with the Contracting Office's technical representative (COTR) , the Contractor's QA representative, the Contractor's Controls Contractor representative, and the control system Owner to develop a mutual understanding relate to the details of the PVT work requirements, including required submittals, work schedule, and field quality control.

3.6.2 Performance Verification Testing and Commissioning

PVT testing is a Government quality assurance function that includes systems trending and field tests. Commissioning is a quality control function that is the Commissioning Team’s responsibility to the extent required by this contract.

3.6.3 Performance Verification Testing of Equipment with Packaged Controls

Controls Contractor and Equipment Supplier(s) must share and coordinate PVT testing responsibilities for equipment provided with on-board factory packaged controls such as boiler controllers, dedicated outside air systems (DOAS’s), and packaged pumping systems.

3.6.3.1 Controls Contractor Responsibilities

The Controls Contractor must provide a PVT Plan separate from Equipment Supplier’s performance verification testing plan, perform endurance testing, and perform PVT testing concurrent with Equipment Suppliers’ testing for equipment provided with on-board factory packaged controls to demonstrate the following:

a. Equipment enabling and disabling.

b. Equipment standard and optional control points necessary to accomplish functionality regardless if specified in contract documents or not.

c. Equipment standard and optional alarms critical to safe operation regardless if specified in contract documents or not.

d. All control points added by Controls Contractor in addition to onboard factory packaged controls regardless if specified in contract documents or not.

Refer to paragraphs titled “Performance Verification Test Plan” and “Endurance Testing” for additional information.

3.6.3.2 Equipment Supplier Responsibilities

Each Equipment Supplier must provide PVT Plans separate from Controls Contractor’s plans and perform PVT testing concurrent with Controls Contractor’s testing for their equipment provided with on-board factory packaged controls to demonstrate the following:

a. Equipment standard and optional control features necessary to accomplish functionality regardless if specified in contract documents or not.

b. Equipment standard and optional operation modes necessary to accomplish functionality regardless if specified in contract documents or not.

c. Equipment standard and optional alarm conditions for safe operation regardless if specified in contract documents or not.

Refer to all paragraphs under paragraph titled “Performance Verification Testing” except for section titled “Endurance Testing” for additional information.

3.6.4 Sequencing of Performance Verification Testing Activities

PVT activities must be sequenced with major activities listed below for Test and Balance (TAB) Contractor, Equipment Suppliers, Commissioning Specialists, and others to demonstrate fully functioning systems. Complete the items in TABLE III: SEQUENCING OF PVT TESTING ACTIVITIES as schedule activities or milestones.

TABLE III: SEQUENCING OF PVT TESTING ACTIVITIES

SEQUENCE	ITEM
1	Submission, review, and approval of Control Contractors PVT Plans.
2	Submission, review, and approval of Equipment Suppliers PVT Plans.
3	Submission, review, and approval of certified final Test and Balance Report.
4	Conduct commissioning functional performance tests.
5	Submission, review, and approval of all of the Commissioning Specialists completed functional performance tests.
6	Request Contracting Officer to allow beginning of Government-witnessed PVT testing.
7	Contracting Officers approval to begin PVT testing.
8	Conduct PVT field work.
9	Governments verbal approval of PVT field work for all systems.
10	Conduct Test and Balance verification field work.

TABLE III: SEQUENCING OF PVT TESTING ACTIVITIES	
SEQUENCE	ITEM
11	Governments written approval of Test and Balance verification field work.
12	Submission, review, and approval of endurance testing.
13	Governments written approval of PVT field work for all systems.
14	Facility acceptance recommendation.
15	Submission, review, and approval of Control Contractors PVT Report.
16	Submission, review, and approval of Equipment Suppliers PVT Report.
17	Conduct applicable re-testing and seasonal testing within 10 months of beneficial occupancy.

3.6.4.1 PVT Testing for Multi-Phase Construction

For air moving systems except outside air systems serving multiple phases, all major activities listed in TABLE III through Government’s verbal approval of Test and Balance verification field work can be completed by phase if all ductwork construction is completed for that phase.

For primary systems such as chilled water systems, HVAC heating hot water systems, and outside air systems serving multiple phases, all major activities listed listed in TABLE III through Government’s verbal approval of Test and Balance verification field work for all air moving systems served by that primary system for that phase must be completed prior to conducting PVT field work for that primary system.

3.6.5 Control Contractor's Performance Verification Testing Plan

Submit a detailed PVT Plan of the proposed control systems testing in this contract for approval prior to its use. Develop and use a single PVT Plan for each system with a unique control sequence. Systems sharing an identical control sequence can be tested using copies of the PVT Plan intended for these systems.

PVT Plans must include system-based, step-by-step test methods demonstrating system performs in accordance with contract document requirements. The Government may provide sample PVT Plans upon request. PVT Plans must include the following:

a. Control sequences from contract documents segmented such that each control algorithm, operation mode, and alarm condition is immediately followed by numbered test methods required to initiate a response, expected response, space for comments, and “pass" or "fail” indication for each expected response.

b. PVT Plans with control sequences from contract documents that are not segmented into parts will not be accepted.

c. Indication where assisting personnel are required such as Mechanical

Contractor.

d. Signature and date lines for the Contractor's PVT administrator, Contractor's quality assurance representative, and Contracting Officer's representative acknowledging completion of testing.

3.6.6 Performance Verification Testing Sample Size

PVT testing sample sizes will be as follows:

a. 100-Percent of the following systems:

(1) primary systems including, but not limited to, chilled water and HVAC heating hot water systems

(2) air handling unit systems including all associated fans except for remote exhaust air fans

(3) DOAS’s including all associated fans except for remote exhaust air fans

b. 20-Percent of each set of systems with a shared identical control sequence for systems such as:

(1) air terminal units

(2) exhaust air fans

(3) terminal equipment such as fan coil units and unit heaters

3.6.6.1 Selection of Systems to Test

For sample sets less than 100-percent, the Government will choose which systems will be tested. The Government may require additional testing if previous testing results are inconsistent or demonstrate improper system control as follows:

a. An additional 25-percent after five-percent failure rate of first sample set.

b. 100-percent after any failures occurring in additional sample set.

3.6.7 Conducting Performance Verification Testing

At least 15 days prior to preferred test date, request the Contracting Officer to allow the beginning of Government-witnessed PVT testing. Provide an estimated time table required to perform testing of each system. Furnish personnel, equipment, instrumentation, and supplies necessary to perform all aspects of testing. Testing personnel must be regularly employed in the testing and calibration of control systems. After receipt of Contracting Officer’s approval to begin testing, perform PVT testing using project's as-built (shop) control system drawings, project's design drawings, and approved PVT Plans.

During testing, identify deficiencies that do not meet contract document requirements. Deficiencies must be investigated, corrected with corrections documented, and re-tested at a later date following procedures for the initial PVT testing. The Government may require re-testing of any control system components affected by the original failed test.

3.6.8 Endurance Testing

3.6.8.1 General

Conduct endurance testing in conjunction with the PVT to demonstrate control loop stability and accuracy. For all control loops tested, record trend data of the control variables over time, demonstrating that the control loop responds to a sudden change of the control variable set point without excessive overshoot or undershoot. Conduct endurance testing for each system subject to PVT testing. Systems must be operating as normally anticipated during occupancy throughout endurance testing.

Endurance testing results must clearly demonstrate control loop stability and accuracy. Controlled loop outputs must be stable and accurately maintain each setpoint.

3.6.8.2 Hardware

Use hardware provided in this contract for testing.

If insufficient buffer capacity exists to trend the entire endurance test, upload trend data during the course of endurance testing to ensure all trend data is retained. Lost trend data will require retesting of all control points for affected system(s).

3.6.8.3 Endurance Testing Results Format

Submit endurance testing results for each tested system in a graphical format complete with clear indication of value(s) for y-axis, value for x-axis, and legend identifying each trended control point. The number of control points contained on a single graph must be such that all control points can be clearly visible. Control points must be logically grouped such that related points appear on a single graph. In addition, submit a separate comma separated value (CSV) file of raw trend data for each trended system. Each trended control point in CSV file must be clearly identified.

For control points recorded based on change of value, change of value for recording data must be clearly identified for each control point.

3.6.8.4 Endurance Testing Start, Duration, and Frequency

Trending of all control points for a given system must start at an identical date and time regardless of the basis of data collection. Duration of all endurance tests must be at least one-week.

Unless specified otherwise for control points recorded based on time, frequency of data collection must be 15-minutes . Frequency of data collection for specific types of control points is as follows:

3.6.8.4.1 Points Trended at One Minute Intervals

a. Temperature for supply air, return air, mixed air, supply water, and return water

b. Temperature for outside air, supply air, return air and exhaust air

entering and leaving energy recovery device

c. Flow for supply air, return air, outside air, chilled water, and HVAC heating hot water

d. Flow for exhaust air associated with energy recovery

e. Relative humidity for outside air and return air

f. Relative humidity for outside air, supply air, return air and exhaust air entering and leaving energy recovery device

g. Command and status for control dampers and control valves

h. Speed for fans and pumps

i. Pressure for fans and pumps

3.6.8.4.2 Points Trended at 15 Minute Intervals

a. Temperature and relative humidity for zones

b. Temperature and relative humidity for outside air not associated with energy recovery

c. Command and status for equipment

d. Pressure relative to the outside for facility

3.6.8.5 Trended Control Points

Trended control points for each system must demonstrate each system performs in accordance with contract document requirements. Trended control points must include, but not be limited to, control points listed in contract document points list.

Minimum control points that are required to be trended for selected systems are listed below. These control points must be trended as applicable to this contract in addition to control points necessary to demonstrate systems perform in accordance with contract document requirements and those listed in contract document’s points list.

3.6.8.5.1 Air Handling Unit

a. Outside air actual dry-bulb temperature

b. Outside air actual relative humidity

c. Outside air setpoint and actual airflow

d. Minimum outside air control damper command

e. Facility setpoint and actual relative pressure

f. Return air actual dry-bulb temperature

g. Return air actual relative humidity

h. Return air control damper command

i. Mixed air setpoint and setpoint and actual temperature

j. Preheat coil leaving air setpoint and actual temperature

k. Preheat coil control actuator command

l. Cooling coil leaving air setpoint and actual temperature

m. Cooling coil control valve command

n. Supply air fan actual speed

o. Discharge air actual temperature

p. Supply air fan setpoint and actual static pressure

3.6.8.6 Endurance Testing Sample Size

Endurance Testing sample sizes ware as follows:

a. 100-Percent of the following systems:

(1) primary systems including, but not limited to, chilled water and HVAC heating hot water systems

(2) air handling unit systems including all associated fans except for remote exhaust air fans

(3) DOAS’s including all associated fans except for remote exhaust air fans

b. 20-Percent of each set of systems with a shared identical control sequence for systems such as:

(1) exhaust air fans3.6.8.6.1 Selection of Systems to Test

For sample sets less than 100-percent, the Government will choose which systems will be tested. The Government may require additional testing if previous testing results are inconsistent or demonstrate improper system control as follows:

a. An additional 25-percent after five-percent failure rate of first sample set.

b. 100-percent after any failures occurring in additional sample set.

3.6.9 Performance Verification Test Report

Submit a PVT Report after receiving Government’s written approval of PVT field work that is intended to document test results and final control system sequences and settings prior to turnover. The PVT Report must contain the following:

a. Executive summary that briefly discusses results of each system’s endurance testing and PVT testing and conclusions for each system.

b. Endurance testing for each system.

c. Completed PVT Plan for each system used during testing that includes hand written field notes and participant signatures.

d. Blank PVT Plan for each system approved prior to testing that is edited to reflect changes occurring during testing. Edits must be typed and must reflect changes to control sequences from contract documents, must reflect changes to numbered test methods required to initiate a response, and must reflect changes to expected response. Only one blank PVT Plan is required for each set of systems sharing an identical control sequence, such as air terminal units, exhaust air fans, fan coil units and unit heaters.

e. Written certification that the installation and testing of all systems are complete and meet all contract document requirements.

3.7 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

Provide HVAC control System Operation and Maintenance Instructions which include:

a. "Data Package 3" as indicated in Section 01 78 23 OPERATION AND MAINTENANCE DATA for each piece of control equipment.

b. "Data Package 4" as described in Section 01 78 23 OPERATION AND MAINTENANCE DATA for all air compressors.

c. HVAC control system sequences of operation formatted as indicated.

d. Procedures for the HVAC system start-up, operation and shut-down including the manufacturer's supplied procedures for each piece of equipment, and procedures for the overall HVAC system.

e. As-built HVAC control system detail drawings formatted as indicated.

f. Routine maintenance checklist. Provide the routine maintenance checklist arranged in a columnar format, where the first column lists all installed devices, the second column states the maintenance activity or that no maintenance required, the third column states the frequency of the maintenance activity, and the fourth column is used for additional comments or reference.

g. Qualified service organization list, including at a minimum company name, contact name and phone number.

h. Start-Up Testing Report.

i. Performance Verification Test (PVT) Procedures and Report.

Submit 2 copies of the Operation and Maintenance Instructions, indexed and in booklet form. The Operation and Maintenance Instructions may be submitted as a Technical Data Package.

3.8 MAINTENANCE AND SERVICE

Provide services, materials and equipment as necessary to maintain the entire system in an operational state as indicated for a period of one year

from the date of final acceptance of the project. Minimize impacts on facility operations.

a. The integration of the system specified in this section into a Utility Monitoring and Control System must not, of itself, void the warranty or otherwise alter the requirement for the one year maintenance and service period. Integration into a UMCS includes but is not limited to establishing communication between devices in the control system and the front end or devices in another system.

b. The changing of configuration properties must not, of itself, void the warranty or otherwise alter the requirement for the one year maintenance and service period.

3.8.1 Description of Work

Provide adjustment and repair of the system including the manufacturer's required sensor and actuator (including transducer) calibration, span and range adjustment.

3.8.2 Personnel

Use only service personnel qualified to accomplish work promptly and satisfactorily. Advise the Government in writing of the name of the designated service representative, and of any changes in personnel.

3.8.3 Scheduled Inspections

Perform two inspections at six-month intervals and provide work required. Perform inspections in June and December. During each inspection perform the indicated tasks:

a. Perform visual checks and operational tests of equipment.

b. Clean control system equipment including interior and exterior surfaces.

c. Check and calibrate each field device. Check and calibrate 50 percent of the total analog inputs and outputs during the first inspection. Check and calibrate the remaining 50 percent of the analog inputs and outputs during the second major inspection. Certify analog test instrumentation accuracy to be twice the specified accuracy of the device being calibrated. Randomly check at least 25 percent of all binary inputs and outputs for proper operation during the first inspection. Randomly check at least 25 percent of the remaining binary inputs and outputs during the second inspection. If more than 20 percent of checked inputs or outputs failed the calibration check during any inspection, check and recalibrate all inputs and outputs during that inspection.

d. Run system software diagnostics and correct diagnosed problems.

e. Resolve any previous outstanding problems.

3.8.4 Scheduled Work

This work must be performed during regular working hours, Monday through Friday, excluding Federal holidays.

3.8.5 Emergency Service

The Government will initiate service calls when the system is not functioning properly. Qualified personnel must be available to provide service to the system. A telephone number where the service supervisor can be reached at all times must be provided. Service personnel must be at the site within 24 hours after receiving a request for service. The control system must be restored to proper operating condition as required per Section 01 78 00 CLOSEOUT SUBMITTALS.

3.8.6 Operation

After performing scheduled adjustments and repairs, verify control system operation as demonstrated by the applicable tests of the performance verification test.

3.8.7 Records and Logs

Keep dated records and logs of each task, with cumulative records for each major component, and for the complete system chronologically. Maintain a continuous log for all devices, including initial analog span and zero calibration values and digital points. Keep complete logs and provide logs for inspection onsite, demonstrating that planned and systematic adjustments and repairs have been accomplished for the control system.

3.8.8 Work Requests

Record each service call request as received and include its location, date and time the call was received, nature of trouble, names of the service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the materials to be used, the time and date work started, and the time and date of completion. Submit a record of the work performed within 5 days after work is accomplished.

3.8.9 System Modifications

Submit recommendations for system modification in writing. Do not make system modifications, including operating parameters and control settings, without prior approval of the Government.

3.9 TRAINING

Conduct a training course for 8 operating staff members designated by the Government in the maintenance and operation of the system, including specified hardware and software. Conduct 32 hours of training at the project site within 30 days after successful completion of the performance verification test. The Government reserves the right to make audio and visual recordings (using Government supplied equipment)of the training sessions for later use. Provide audiovisual equipment and other training materials and supplies required to conduct training. A training day is defined as 8 hours of classroom instruction, including two 15 minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility.

3.9.1 Training Documentation

Prepare training documentation consisting of:

a. Course Attendee List: Develop the list of course attendees in

coordination with and signed by the Controls shop supervisor.

b. Training Manuals: Provide training manuals which include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. When presenting portions of the course material by audiovisuals, deliver copies of those audiovisuals as a part of the printed training manuals.

3.9.2 Training Course Content

For guidance in planning the required instruction, assume that attendees will have a high school education, and are familiar with HVAC systems. During the training course, cover all of the material contained in the Operating and Maintenance Instructions, the layout and location of each controller enclosure, the layout of one of each type of equipment and the locations of each, the location of each control device external to the panels, the location of the compressed air station, preventive maintenance, troubleshooting, diagnostics, calibration, adjustment, commissioning, tuning, and repair procedures. Typical systems and similar systems may be treated as a group, with instruction on the physical layout of one such system. Present the results of the performance verification test and the Start-Up Testing Report as benchmarks of HVAC control system performance by which to measure operation and maintenance effectiveness.

3.9.3 Training Documentation Submittal Requirements

Submit hardcopy training manuals and all training materials on CD-ROM. Provide one hardcopy manual for each trainee on the Course Attendee List and 2 additional copies for archive at the project site. Provide 2 copies of the Course Attendee List with the archival copies. Training Documentation may be submitted as a Technical Data Package.

APPENDIX A

QC CHECKLIST FOR BACNET SYSTEMS

This checklist is not all-inclusive of the requirements of this specification and should not be interpreted as such.

Instructions: Initial each item in the space provided (|____|) verifying that the requirement has been met.

This checklist is for (circle one:)

Pre-Construction QC Checklist Submittal

Post-Construction QC Checklist Submittal

Close-out QC Checklist Submittal

Items verified for Pre-Construction, Post-Construction and Closeout QC Checklist Submittals:

1	All DDC Hardware is numbered on Control System Schematic Drawings.	|____|
2	Signal lines on Control System Schematic are labeled with the signal type.	|____|
3	Local Display Panel (LDP) Locations are shown on Control System Schematic drawings.	|____|

Items verified for Post-Construction and Closeout QC Checklist Submittals:

4	All sequences are performed as specified using DDC Hardware.	|____|
5	Training schedule and course attendee list has been developed and coordinated with shops and submitted.	|____|

Items verified for Closeout QC Checklist Submittal:

6	Final As-built Drawings, including all Points Schedule drawings, accurately represent the final installed system.	|____|
7	Programming software has been submitted for all programmable controllers.	|____|
8	All software has been licensed to the Government.	

QC CHECKLIST FOR BACNET SYSTEMS		
9	O&M Instructions have been completed and submitted.	|_____|
10	Training course has been completed.	|_____|
11	All DDC Hardware is installed on a BACnet ASHRAE 135 network using either MS/TP in accordance with Clause 9 or IP in accordance with Annex J.	|_____|
12	All DDC Hardware is BTL listed.	|_____|
13	Communication between DDC Hardware is only via BACnet using standard services, except as specifically permitted by the specification. Non-standard services have been fully documented in the DDC Hardware Schedule.	|_____|
14	Scheduling, Alarming, and Trending have been implemented using the standard BACnet Objects for these functions.	|_____|
15	All Properties indicated as required to be Writable are Writable and Overrides have been provided as indicated	|_____|
	_____ _____	
	(QC Representative Signature) (Date)	

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SECTION 23 09 13.00 22

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC
08/20, CHG 1: 03/22

PART 1 GENERAL

1.1 SUMMARY

This section provides for the instrumentation control system components excluding direct digital controllers, network controllers, gateways etc. that are necessary for a completely functional automatic control system. When combined with a Direct Digital Control (DDC) system, the Instrumentation and Control Devices covered under this section must be a complete system suitable for the control of the heating, ventilating and air conditioning (HVAC) and other building-level systems as specified and indicated.

a. Install hardware to perform the control sequences as specified and indicated and to provide control of the equipment as specified and indicated.

b. Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.

c. Install and configure hardware such that the Government or their agents are able to perform repair, replacement, and upgrades of individual hardware without further interaction with the installing Contractor.

1.1.1 Verification of Dimensions

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 any work.

1.1.2 Drawings

The Government will not indicate all offsets, fittings, and accessories that may be required on the drawings. Carefully investigate the mechanical, electrical, and finish conditions that could affect the work to be performed, arrange such work accordingly, and provide all work necessary to meet such conditions.

1.2 RELATED SECTIONS

Related work specified elsewhere.

Section 01 30 00 ADMINISTRATIVE REQUIREMENTS

Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC

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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 500-D	(2018) Laboratory Methods of Testing Dampers for Rating
AMCA 511	(2010; R 2016) Certified Ratings Program for Air Control Devices

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 90A	(2024) Standard for the Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

UL 5085-3	(2006; Reprint Jan 2022) UL Standard for Safety Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers

1.4 SUBMITTALS

Submittal requirements are specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

1.5 DELIVERY AND STORAGE

Store and protect products from the weather, humidity, and temperature variations, dirt and dust, and other contaminants, within the storage condition limits published by the equipment manufacturer.

1.6 INPUT MEASUREMENT ACCURACY

Select, install and configure sensors, transmitters and DDC Hardware such that the maximum error of the measured value at the input of the DDC hardware is less than the maximum allowable error specified for the sensor or instrumentation.

1.7 SUBCONTRACTOR SPECIAL REQUIREMENTS

Perform all work in this section in accordance with the paragraph entitled CONTRACTOR SPECIAL REQUIREMENTS in Section 01 30 00 ADMINISTRATIVE REQUIREMENTS.

PART 2 PRODUCTS

2.1 EQUIPMENT

2.1.1 General Requirements

All products used to meet this specification must meet the indicated requirements, but not all products specified here will be required by every project. All products must meet the requirements both Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and this Section.

2.1.2 Operation Environment Requirements

Unless otherwise specified, provide products rated for continuous operation under the following conditions:

2.1.2.1 Pressure

Pressure conditions normally encountered in the installed location.

2.1.2.2 Vibration

Vibration conditions normally encountered in the installed location.

2.1.2.3 Temperature

a. Products installed indoors: Ambient temperatures in the range of 32 to 112 degrees F and temperature conditions outside this range normally encountered at the installed location.

b. Products installed outdoors or in unconditioned indoor spaces: Ambient temperatures in the range of -35 to +151 degrees F and temperature conditions outside this range normally encountered at the installed location.

2.1.2.4 Humidity

10 to 95 percent relative humidity, non-condensing and also humidity conditions outside this range normally encountered at the installed location.

2.2 WEATHERSHIELDS

Provide weathershields constructed of galvanized steel painted white, unpainted aluminum, aluminum painted white, or white PVC.

2.3 WIRE AND CABLE

Provide wire and cable meeting the requirements of NFPA 70 and NFPA 90A in addition to the requirements of this specification and referenced specifications.

2.3.1 Terminal Blocks

For terminal blocks which are not integral to other equipment, provide terminal blocks which are insulated, modular, feed-through, clamp style with recessed captive screw-type clamping mechanism, suitable for DIN rail mounting, and which have enclosed sides or end plates and partition plates for separation.

2.3.2 Control Wiring for Binary Signals

For Control Wiring for Binary Signals, provide 18 AWG copper or thicker wire rated for 300-volt service.

2.3.3 Control Wiring for Analog Signals

For Control Wiring for Analog Signals, provide 18 AWG or thicker, copper, single- or multiple-twisted wire meeting the following requirements:

a. Minimum 2 inch lay of twist.

b. 100 percent shielded pairs.

c. At least 300-volt insulation.

d. Each pair has a 20 AWG tinned-copper drain wire and individual overall pair insulation.

e. Cables have an overall aluminum-polyester or tinned-copper cable-shield tape, overall 20 AWG tinned-copper cable drain wire, and overall cable insulation.

2.3.4 Power Wiring for Control Devices

For 24-volt circuits, provide insulated copper 18 AWG or thicker wire rated for 300 VAC service. For 120-volt circuits, provide 14 AWG or thicker stranded copper wire rated for 600-volt service.

2.3.5 Transformers

Provide UL 5085-3 approved transformers. Select transformers sized so that the connected load is no greater than 80 percent of the transformer rated capacity.

2.4 DAMPERS

2.4.1 Damper Assembly

Provide single damper sections with blades no longer than 48 inches and which are no higher than 72 inches and damper blade width of 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 0.07 inch minimum thickness galvanized steel channels with mitered and welded corners. Steel channel frames constructed of 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 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 0.04 inches water gauge at 1000 ft/min in the wide-open position. Provide dampers with frames not less than 2 inch in width. Provide dampers which have been tested in accordance with AMCA 500-D.

2.4.2 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.

2.4.3 Damper Types

2.4.3.1 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 on the 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 1A requirements. Outside air damper seals must be suitable for an operating temperature range of -40 to +167 degrees F. Dampers must be rated at not less than 2000 ft/min air velocity.

2.4.3.2 Mechanical Rooms and Other Utility Space Ventilation Dampers

Provide utility space ventilation dampers as indicated. Unless otherwise indicated provide AMCA 511 Class 1A dampers. Provide dampers rated at not less than 1500 ft/min air velocity.

2.5 SENSORS AND INSTRUMENTATION

Unless otherwise specified, provide sensors and instrumentation which incorporate an integral transmitter. Sensors and instrumentation, including their transmitters, must meet the specified accuracy and drift requirements at the input of the connected DDC Hardware's analog-to-digital conversion.

2.5.1 Analog and Binary Transmitters

Provide transmitters which match the characteristics of the sensor. Transmitters providing analog values must produce a linear 4-20 mAdc, 0-10 Vdc signal corresponding to the required operating range and must have zero and span adjustment. Transmitters providing binary values must have dry contacts rated at 1A at 24 Volts AC.

2.5.2 Network Transmitters

Sensors and Instrumentation incorporating an integral network connection are considered DDC Hardware and must meet the DDC Hardware requirements of 23 09 23.02 22 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS when used in a BACnet network.

2.5.3 Temperature Sensors

Provide the same sensor type throughout the project. Temperature sensors may be provided without transmitters. Where transmitters are used, the range must be the smallest available from the manufacturer and suitable for the application such that the range encompasses the expected range of temperatures to be measured. The end to end accuracy includes the combined effect of sensitivity, hysteresis, linearity and repeatability between the measured variable and the end user interface (graphic presentation) including transmitters if used.

2.5.3.1 Sensor Accuracy and Stability of Control

2.5.3.1.1 Conditioned Space Temperature

Plus or minus 0.5 degree F over the operating range.

2.5.3.1.2 Unconditioned Space Temperature

a. Plus or minus 1 degree F over the range of 30 to 131 degrees F AND

b. Plus or minus 4 degrees F over the rest of the operating range.

2.5.3.1.3 Duct Temperature

Plus or minus 0.5 degree F

2.5.3.1.4 Outside Air Temperature

a. Plus or minus 2 degrees F over the range of -30 to +130 degrees F AND

b. Plus or minus 1 degree F over the range of 30 to 130 degrees F.

2.5.3.2 Transmitter Drift

The maximum allowable transmitter drift: 0.25 degrees F per year.

2.5.3.3 Point Temperature Sensors

Point Sensors must be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper.

2.5.3.4 Temperature Sensor Details

2.5.3.4.1 Room Type

Provide the sensing element components within a decorative protective cover suitable for surrounding decor.

2.5.3.4.2 Duct Probe Type

Ensure the probe is long enough to properly sense the air stream temperature.

2.5.3.4.3 Duct Averaging Type

Continuous averaging sensors must be one foot in length for each 1 square foot of duct cross-sectional area, and a minimum length of 5 feet.

2.5.3.4.4 Outside Air Type

Provide the sensing element rated for outdoor use

2.5.4 Relative Humidity Sensor

Relative humidity sensors must use bulk polymer resistive or thin film capacitive type non-saturating sensing elements capable of withstanding a saturated condition without permanently affecting calibration or sustaining damage. The sensors must include removable protective membrane filters. Where required for exterior installation, sensors must be capable of surviving below freezing temperatures and direct contact with moisture without affecting sensor calibration. When used indoors, the sensor must be capable of being exposed to a condensing air stream (100 percent relative humidity) with no adverse effect to the sensor's calibration or other harm to the instrument. The sensor must be of the wall-mounted or duct-mounted type, as required by the application, and must be provided with any required accessories. Sensors used in duct high-limit applications must have a bulk polymer resistive sensing element. Duct-mounted sensors must be provided with a duct probe designed to protect the sensing element from dust accumulation and mechanical damage. Relative humidity (RH) sensors must measure relative humidity over a range of 0 percent to 100 percent with an accuracy of plus or minus 3 percent. RH sensors must function over a temperature range of 40 to 135 degrees F and must not drift more than 1 percent per year.

2.5.5 Differential Pressure Instrumentation

2.5.5.1 Differential Pressure Sensors

Provide Differential Pressure Sensors with ranges as indicated or as required for the application. Pressure sensor ranges must not exceed the high end range indicated on the Points Schedule by more than 50 percent. The over pressure rating must be a minimum of 150 percent of the highest design pressure of either input to the sensor. The accuracy must be plus or minus 1 percent of full scale. The sensor must have a maximum drift of 2 percent per year

2.5.5.2 Differential Pressure Switch

Provide differential pressure switches with a user-adjustable setpoint which are sized for the application such that the setpoint is between 25 percent and 75 percent of the full range. The over pressure rating must be a minimum of 150 percent of the highest design pressure of either input to the sensor. The switch must have two sets of contacts and each contact must have a rating greater than it's connected load. Contacts must open or close upon rise of pressure above the setpoint or drop of pressure below the setpoint as indicated.

2.5.6 Flow Sensors

2.5.6.1 Airflow Measurement Array (AFMA)

2.5.6.1.1 Airflow Straightener

Provide AFMAs which contain an airflow straightener if required by the AFMA manufacturer's published installation instructions. The straightener must be contained inside a flanged sheet metal casing, with the AFMA located as specified according to the published recommendation of the AFMA

manufacturer. In the absence of published documentation, provide airflow straighteners if there is any duct obstruction within 5 duct diameters upstream of the AFMA. Air-flow straighteners, where required, must be constructed of 0.125 inch aluminum honeycomb and the depth of the straightener must not be less than 1.5 inches.

2.5.6.1.2 Resistance to Airflow

The resistance to air flow through the AFMA, including the airflow straightener must not exceed 0.085 inch water gauge at an airflow of 2,000 fpm. AFMA construction must be suitable for operation at airflows of up to 5000 fpm over a temperature range of 40 to 120 degrees F.

2.5.6.1.3 Outside Air Temperature

In outside air measurement or in low-temperature air delivery applications, provide an AFMA certified by the manufacturer to be accurate as specified over a temperature range of -20 to +120 degrees F .

2.5.6.1.4 Electronic AFMA

Each electronic AFMA must consist of an array of velocity sensing elements of the resistance temperature detector (RTD) or thermistor type. The sensing elements must be distributed across the duct cross section in the quantity and pattern specified or recommended by the published application data of the AFMA manufacturer. Electronic AFMAs must have an accuracy of plus or minus 5 percent over a range of 125 to 5,000 fpm and the output must be temperature compensated over a range of 32 to 212 degrees F.

2.5.6.1.5 Fan Inlet Measurement Devices

Fan inlet measurement devices cannot be used unless indicated on the drawings or schedules.

2.5.7 Electrical Instruments

Provide Electrical Instruments with an input range as indicated or sized for the application. Unless otherwise specified, AC instrumentation must be suitable for 60 Hz operation.

2.5.7.1 Current Transducers

Current transducers must accept an AC current input and must have an accuracy of plus or minus 2 percent of full scale. The device must have a means for calibration. Current transducers for variable frequency applications must be rated for variable frequency operation.

2.5.7.2 Current Sensing Relays (CSRs)

Current sensing relays (CSRs) must provide a normally-open contact with a voltage and amperage rating greater than its connected load. Current sensing relays must be of split-core design. The CSR must be rated for operation at 200 percent of the connected load. Voltage isolation must be a minimum of 600 volts. The CSR must auto-calibrate to the connected load or be adjustable and field calibrated. Current sensors for variable frequency applications must be rated for variable frequency operation.

2.5.7.3 Voltage Transducers

Voltage transducers must accept an AC voltage input and have an accuracy of plus or minus 0.25 percent of full scale. The device must have a means for calibration. Line side fuses for transducer protection must be provided.

2.5.8 Compressed Air Dew Point Sensor

Sensor must be suitable for measurement of dew point from -40 +80 degrees F over a pressure range of 0 to 150 psig. The transmitter must provide both dry bulb and dew point temperatures on separate outputs. The end to end accuracy of the dew point must be plus or minus 5 degrees F and the dry bulb must be plus or minus 1 degree F. Sensor must be automatic zeroing and must require no normal maintenance or periodic recalibration.

2.5.9 Temperature Switch

2.5.9.1 Duct Mount Temperature Low Limit Safety Switch (Freezestat)

Duct mount temperature low limit switches (Freezestats) must be manual reset, low temperature safety switches at least 1 foot long per square foot of coverage which must respond to the coldest 18 inch segment with an accuracy of plus or minus 3.6 degrees F. The switch must have a field-adjustable setpoint with a range of at least 30 to 50 degrees F. The switch must have two sets of contacts, and each contact must have a rating greater than its connected load. Contacts must open or close upon drop of temperature below setpoint as indicated and must remain in this state until reset.

2.5.10 Damper End Switches

Each end switch must be a hermetically sealed switch with a trip lever and over-travel mechanism. The switch enclosure must be suitable for mounting on the duct exterior and must permit setting the position of the trip lever that actuates the switch. The trip lever must be aligned with the damper blade.

End switches integral to an electric damper actuator are allowed as long as at least one is adjustable over the travel of the actuator.

2.6 INDICATING DEVICES

All indicating devices must display readings in English (inch-pound) units.

2.6.1 Thermometers

Provide bi-metal type thermometers at locations indicated. Thermometers must have either 9 inch long scales or 3.5 inch diameter dials, with insertion, immersion, or averaging elements. Provide matching thermowells for pipe-mounted installations. Select scale ranges suitable for the intended service, with the normal operating temperature near the scale's midpoint. The thermometer's accuracy must be plus or minus 2 percent of the scale range.

2.6.1.1 Air-Duct Thermometers

Air-duct thermometers must have perforated stem guards and 45-degree adjustable duct flanges with locking mechanism.

2.7 OUTPUT DEVICES

2.7.1 Actuators

Actuators must be electric (electronic) . All actuators must be normally open (NO), normally closed (NC) or fail-in-last-position (FILP) as indicated. Normally open and normally closed actuators must be of mechanical spring return type. Electric actuators must have an electronic cut off or other means to provide burnout protection if stalled. Actuators must have a visible position indicator. Electric actuators must provide position feedback to the controller as indicated. Actuators must smoothly and fully open or close the devices to which they are applied. Electric actuators must have a full stroke response time in both directions of 90 seconds or less at rated load. Electric actuators must be of the foot-mounted type with an oil-immersed gear train or the direct-coupled type. Where multiple electric actuators operate from a common signal, the actuators must provide an output signal identical to its input signal to the additional devices. All actuators must be rated for their operating environment. Actuators used outdoors must be designed and rated for outdoor use. Actuators under continuous exposure to water, such as those used in sumps, must be submersible.

Actuators incorporating an integral network connection are considered DDC Hardware and must meet the DDC Hardware requirements of Section 23 09 23.02 22 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

2.7.1.1 Damper Actuators

Damper actuators must provide the torque necessary per damper manufacturer's instructions to modulate the dampers smoothly over its full range of operation and torque must be at least 6 inch-pounds/1 square foot of damper area for opposed blade dampers and 9 inch-pounds/1 square foot of damper area for parallel blade dampers.

2.7.1.2 Electric Actuators

Each actuator must have distinct markings indicating the full-open and full-closed position Each actuator must deliver the torque required for continuous uniform motion and must have internal end switches to limit the travel, or be capable of withstanding continuous stalling without damage. Actuators must function properly within 85 to 110 percent of rated line voltage. Provide actuators with hardened steel running shafts and gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 inch-pounds.

a. Two-position actuators must be single direction, spring return, or reversing type. Two position actuator signals may either be the control power voltage or line voltage as needed for torque or appropriate interlock circuits.

b. Modulating actuators must be capable of stopping at any point in the cycle, and starting in either direction from any point. Actuators must be equipped with a switch for reversing direction, and a button to disengage the clutch to allow manual adjustments. Provide the actuator with a hand crank for manual adjustments, as applicable. Modulating actuator input signals can either be a 4 to 20 mAdc or a 0-10 VDC signal.

c. Floating or pulse width modulation actuators are acceptable for non-fail safe applications unless indicated otherwise provided that the floating point control (timed actuation) must have a scheduled re-calibration of span and position no more than once a day and no less than once a week. The schedule for the re-calibration should not affect occupied conditions and be staggered between equipment to prevent falsely loading or unloading central plant equipment.

2.7.2 Relays

Relays must have contacts rated for the intended application, indicator light, and dust proof enclosure. The indicator light must be lit when the coil is energized and off when coil is not energized.

Control relay contacts must have utilization category and ratings selected for the application. Each set of contacts must incorporate a normally open (NO), normally closed (NC) and common contact. Relays must be rated for a minimum life of one million operations.

2.8 USER INPUT DEVICES

User Input Devices, including potentiometers, switches and momentary contact push-buttons. Potentiometers must be of the thumb wheel or sliding bar type. Momentary Contact Push-Buttons may include an adjustable timer for their output. User input devices must be labeled for their function.

2.9 MULTIFUNCTION DEVICES

Multifunction devices are products which combine the functions of multiple sensor, user input or output devices into a single product. Unless otherwise specified, the multifunction device must meet all requirements of each component device. Where the requirements for the component devices conflict, the multifunction device must meet the most stringent of the requirements.

2.9.1 Current Sensing Relay Command Switch

The Current Sensing Relay portion must meet all requirements of the Current Sensing Relay input device. The Command Switch portion must meet all requirements of the Relay output device except that it must have at least one normally-open (NO) contact.

Current Sensing Relays used for Variable Frequency Drives must be rated for Variable Frequency applications unless installed on the source side of the drive. If used in this situation, the threshold for showing status must be set to allow for the VFD's control power when the drive is not enabled and provide indication of operation when the drive is enabled at minimum speed.

2.9.2 Space Sensor Module

Space Sensor Modules must be multifunction devices incorporating a temperature sensor and one or more of the following as specified and indicated on the Space Sensor Module Schedule:

a. A temperature indicating device.

b. A User Input Device which must adjust a temperature setpoint output.

c. A User Input Momentary Contact Button and an output to the control system indicating zone occupancy.

d. A three position User Input Switch labeled to indicate heating, cooling and off positions ('HEAT-COOL-OFF' switch) and providing corresponding outputs to the control system.

e. A two position User Input Switch labeled with 'AUTO' and 'ON' positions and providing corresponding output to the control system..

f. A multi-position User Input Switch with 'OFF' and at least two fan speed positions and providing corresponding outputs to the control system.

Space Sensor Modules cannot contain mercury (Hg).

2.10 SUPERVISORY BUILDING CONTROLLER

Provide a Supervisory Building controller. This will serve as both the Supervisory Building Controller and the connection point between the buildings DDC and the UMCS. Provide a five-year service license on all Supervisory Controllers. Provide a reserve of 10 percent of additional points and additional devices on the Supervisory Controller license at the final project acceptance. The contractor shall assign Public Works Department as the owner and manager of all licenses including 3rd party drivers.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 General Installation Requirements

Perform the installation under the supervision of competent technicians regularly employed in the installation of DDC systems.

3.1.1.1 Device Mounting Criteria

All devices must be installed in accordance with manufacturer's recommendations and as specified and indicated. Control devices to be installed in piping and ductwork must be provided with required gaskets, flanges, thermal compounds, insulation, piping, fittings, and manual valves for shutoff, equalization, purging, and calibration. Strap-on temperature sensing elements must not be used except as specified. Spare thermowells must be installed adjacent to each thermowell containing a sensor and as indicated. Devices located outdoors must have a weathershield.

3.1.1.2 Labels and Tags

Match labels and tags to the unique identifiers indicated on the As-Built drawings. Label all enclosures and instrumentation. Tag all sensors and actuators in mechanical rooms. Tag airflow measurement arrays to show flow rate range for signal output range, duct size, and pitot tube AFMA flow coefficient. Tag duct static pressure taps at the location of the pressure tap. Provide plastic or metal tags, mechanically attached directly to each device or attached by a metal chain or wire. Labels

exterior to protective enclosures must be engraved plastic and mechanically attached to the enclosure or instrumentation. Labels inside protective enclosures may attached using adhesive, but must not be hand written.

3.1.2 Weathershield

Provide weathershields for sensors located outdoors. Install weathershields such that they prevent the sun from directly striking the sensor and prevent rain from directly striking or dripping onto the sensor. Install weather shields with adequate ventilation so that the sensing element responds to the ambient conditions of the surroundings. When installing weathershields near outside air intake ducts, install them such that normal outside air flow does not cause rainwater to strike the sensor.

3.1.3 Room Instrument Mounting

Mount room instruments, including but not limited to wall mounted non-adjustable space sensor modules and sensors located in occupied spaces, 48 inches above the floor unless otherwise indicated. Install adjustable devices to be ADA compliant unless otherwise indicated on the Room Sensor Schedule:

a. Space Sensor Modules for Fan Coil Units may be either unit or wall mounted but not mounted on an exterior wall.

b. Wall mount all other Space Sensor Modules.

3.1.4 Switches

3.1.4.1 Temperature Limit Switch

Provide a temperature limit switch (freezestat) to sense the temperature at the location indicated. Provide a sufficient number of temperature limit switches (freezestats) to provide complete coverage of the duct section but no less than 1 foot in length per square foot of cross sectional area. Install manual reset limit switches in approved, accessible locations where they can be reset easily. Install temperature limit switch (freezestat) sensing elements in a side-to-side (not top-to-bottom) serpentine pattern with the relay section at the highest point and in accordance with the manufacturer's installation instructions.

3.1.4.2 Hand-Off Auto Switches

Wire safety controls such as smoke detectors and freeze protection thermostats and emergency shut down switches to protect the equipment during both hand and auto operation.

3.1.4.3 HVAC Emergency Shutdown Switches (ESS)

Switches shall be mounted at 42 inches above finished floor, located as indicated on the drawings. Provide all wiring in electrical metallic conduit. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding 6 foot length shall be permitted in device circuits. Run conduit concealed unless specifically indicated otherwise. Provide system wiring, raceways, pull boxes, installation and workmanship as required by NFPA 70 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.1.5 Temperature Sensors

Install temperature sensors in locations that are accessible and provide a good representation of sensed media. Installations in dead spaces are not acceptable. Calibrate and install sensors according to manufacturer’s instructions. Select sensors only for intended application as designated or recommended by manufacturer.

3.1.5.1 Duct Temperature Sensors

3.1.5.1.1 Probe Type

Place tip of the sensor in the middle of the airstream or in accordance with manufacturer's recommendations or instructions.Provide a gasket between the sensor housing and the duct wall. Seal the duct penetration air tight. When installed in insulated duct, provide enclosure or stand off fitting to accommodate the thickness of duct insulation to allow for maintenance or replacement of the sensor and wiring terminations. Seal the duct insulation penetration vapor tight.

3.1.5.1.2 Averaging Type

Weave the sensing element in a serpentine fashion from side to side perpendicular to the flow, across the duct or air handler cross-section, using durable non-metal supports in accordance with manufacturer's installation instructions. Avoid tight radius bends or kinking of the sensing element. Prevent contact between the sensing element and the duct or air handler internals. Provide a duct access door at the sensor location. The access door must be hinged on the side, factory insulated, have cam type locks, and be as large as the duct will permit, maximum 18 by 18 inches. For sensors inside air handlers, the sensors must be fully accessible through the air handler's access doors without removing any of the air handler's internals.

3.1.6 Air Flow Measurement Arrays (AFMA)

Locate Outside Air AFMAs downstream from the Outside Air filters.

Install AFMAs with the manufacturer's recommended minimum distances between upstream and downstream disturbances. Airflow straighteners may be used to reduce minimum distances as recommended by the AFMA manufacturer.

3.1.7 Duct Static Pressure Sensors

Locate the duct static pressure sensing tap at 75 percent of the distance between the first and last air terminal units as indicated on the design documents. If the transmitter output is a 0-10Vdc signal, locate the transmitter in the same enclosure as the air handling unit (AHU) controller for the AHU serving the terminal units. If a remote duct static pressure sensor is to be used, run the signal wire back to the controller for the air handling unit.

3.1.8 Relative Humidity Sensors

Install relative humidity sensors in supply air ducts at least 10 feet downstream of humidity injection elements.

3.1.9 Dampers

3.1.9.1 Damper Actuators

Provide spring return actuators which fail to a position that protects the served equipment and space on all control dampers related to freeze protection or force protection. For all outside, makeup and relief dampers provide dampers which fail closed. Terminal fan coil units, terminal VAV units, convectors, and unit heaters nay be non-spring return unless indicated otherwise. Do not mount actuators in the air stream. Do not connect multiple actuators to a common drive shaft. Install actuators so that their action seal the damper to the extent required to maintain leakage at or below the specified rate and so that they move the blades smoothly throughout the full range of motion.

3.1.9.2 Damper Installation

Install dampers straight and true, level in all planes, and square in all dimensions. Dampers must move freely without undue stress due to twisting, racking (parallelogramming), bowing, or other installation error. External linkages must operate smoothly over the entire range of motion, without deformation or slipping of any connecting rods, joints or brackets that will prevent a return to it's normal position. Blades must close completely and leakage must not exceed that specified at the rated static pressure. Provide structural support for multi-section dampers. Acceptable methods of structural support include but are not limited to U-channel, angle iron, corner angles and bolts, bent galvanized steel stiffeners, sleeve attachments, braces, and building structure. Where multi-section dampers are installed in ducts or sleeves, they must not sag due to lack of support. Do not use jackshafts to link more than three damper sections. Do not use blade to blade linkages. Install outside and return air dampers such that their blades direct their respective air streams towards each other to provide for maximum mixing of air streams.

3.1.10 Thermometers and Gauges

3.1.10.1 Thermometers

Mount devices to allow reading while standing on the floor or ground, as applicable.

3.1.11 Wire and Cable

Provide complete electrical wiring for the Control System, including wiring to transformer primaries. Wire and Cable must be installed without splices between control devices and in accordance with NFPA 70 and NFPA 90A. Instrumentation grounding must be installed per the device manufacturer's instructions and as necessary to prevent ground loops, noise, and surges from adversely affecting operation of the system. Test installed ground rods as specified in IEEE 142. Cables and conductor wires must be tagged at both ends, with the identifier indicated on the shop drawings. Electrical work must be as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM and as indicated. Wiring external to enclosures must be run in raceways.

Install control circuit wiring not in raceways in a neat and safe manner. Wiring must not use the suspended ceiling system (including tiles, frames or hangers) for support. Where conduit or raceways are required, control circuit wiring must not run in the same conduit/raceway as power wiring

over 50 volts. Run all circuits over 50 volts in conduit, metallic tubing, covered metal raceways, or armored cable.

-- End of Section --

SECTION 23 09 23.02

BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS
02/19, CHG 1: 02/20

PART 1 GENERAL

1.1 SUMMARY

Provide a complete Direct Digital Control (DDC) system suitable for the control of the heating, ventilating and air conditioning (HVAC) and other building-level systems as specified and shown and in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The contractor shall update the existing Johnson Controls server, ADX-1, located in Building 4397 to incorporate and integrate the new DDC system. The update requirements include, but are not limited to the EMCS server database, graphics for the new DDC system and programming of all load management functions. The contractor shall fully test and verify all levels of control and communication of all the DDC system controllers from the existing Johnson Controls ECMS server in Building 4397. The contractor shall also test and verify all levels of control and communication of the new DDC system.

1.1.1 System Requirements

Provide a system meeting the requirements of both Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and this Section and with the following characteristics:

a.

b. Install and configure control hardware to provide ASHRAE 135 Objects and Properties as indicated and as needed to meet the requirements of this specification.

1.1.2 Verification of Specification Requirements

Review all specifications related to the control system installation and advise the Contracting Officer of any discrepancies before performing any work. If Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC or any other Section referenced in this specification is not included in the project specifications advise the Contracting Officer and either obtain the missing Section or obtain Contracting Officer approval before performing any work.

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 135 (2020; Errata 1-2 2021) BACnet—A Data Communication Protocol for Building

Automation and Control Networks

BACNET TESTING LABORATORIES (BTL)

BTL Guide	(v.50; 2022) BACnet Testing Laboratory Implementation Guidelines

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 802.3	(2018) Ethernet

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-485	(1998a; R 2012) Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 15	Radio Frequency Devices (47 CFR 15)

UNDERWRITERS LABORATORIES (UL)

UL 916	(2015; Reprint Oct 2021) UL Standard for Safety Energy Management Equipment

1.3 DEFINITIONS

For definitions related to this section, see Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

1.4 SUBMITTALS

Submittal requirements related to this Section are specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

PART 2 PRODUCTS

All products used to meet this specification must meet the indicated requirements, but not all products specified here will be required by every project. All products must meet the requirements both Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and this Section.

2.1 NETWORK HARDWARE

2.1.1 BACnet Router

All BACnet Routers must be BACnet/IP Routers and must perform layer 3 routing of ASHRAE 135 packets over an IP network in accordance with ASHRAE 135 Annex J and Clause 6. The router must provide the appropriate connection to the IP network and connections to one or more ASHRAE 135 MS/TP networks. Devices used as BACnet Routers must meet the requirements for DDC Hardware, and must support the NM-RC-B BIBB.

2.1.2 BACnet Gateways

In addition to the requirements for DDC Hardware, the BACnet Gateway must meet the following requirements:

a. It must perform bi-directional protocol translation from one non-ASHRAE 135 protocol to ASHRAE 135. BACnet Gateways must incorporate a network connection to an ASHRAE 135 network (either BACnet over IP in accordance with Annex J or MS/TP) and a separate connection appropriate for the non-ASHRAE 135 protocol and media.

b. It must retain its configuration after a power loss of an indefinite time, and must automatically return to their pre-power loss state once power is restored.

c. It must allow bi-directional mapping of data between the non-ASHRAE 135 protocol and Standard Objects as defined in ASHRAE 135. It must support the DS-RP-B BIBB for Objects requiring read access and the DS-WP-B BIBB for Objects requiring write access.

d. It must support the DS-COV-B BIBB.

Although Gateways must meet DDC Hardware requirements they are not DDC Hardware and must not be used when DDC Hardware is required.

2.1.3 Ethernet Switch

Ethernet Switches must be managed switches and must autoconfigure between 10,100 and 1000 megabits per second (MBPS).

2.2 CONTROL NETWORK WIRING

a. BACnet MS/TP communications wiring must be in accordance with ASHRAE 135. The wiring must use shielded, three wire (twisted-pair with reference) cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors must be less than 30 pF per foot.

b. Building Control Network Backbone IP Network must use Ethernet media. Ethernet cables must be CAT-5e at a minimum and meet all requirements of IEEE 802.3 .

2.3 DIRECT DIGITAL CONTROL (DDC) HARDWARE

2.3.1 General Requirements

All DDC Hardware must meet the following requirements:

a. It must be locally powered and must incorporate a light to indicate the device is receiving power.

b. It must conform to the BTL Guide

c. It must be BACnet Testing Laboratory (BTL) Listed.

d. The Manufacturer's Product Data submittal for each piece of DDC Hardware must include the Protocol Implementation Conformance Statement (PICS) for that hardware as specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

e. It must communicate and be interoperable in accordance with ASHRAE 135 and have connections for BACnet IP or MS/TP control network wiring.

f. Other than devices controlling terminal units or functioning solely as

a BACnet Router, it must support DS-COV-B, DS-RPM-A and DS-RPM-B BIBBs.

g. Devices supporting the DS-RP-A BIBB must also support the DS-COV-A BIBB.

h. Application programs, configuration settings and communication information must be stored in a manner such that they persist through loss of power:

(1) Application programs must persist regardless of the length of time power is lost.

(2) Configured settings must persist for any loss of power less than 2,500 hours.

(3) Communication information, including but not limited to COV subscriptions, event reporting destinations, Notification Class Object settings, and internal communication settings, must persist for any loss of power less than 2,500 hours.

i. Internal Clocks:

(1) Clocks in DDC Hardware incorporating a Clock must continue to function for 120 hours upon loss of power to the DDC Hardware.

(2) DDC Hardware incorporating a Clock must support the DM-TS-B or DM-UTC-B BIBB.

j. It must have all functionality indicated and required to support the application (Sequence of Operation or portion thereof) in which it is used, including but not limited to providing Objects as specified and as indicated on the Points Schedule.

k. In addition to these general requirements and the DDC Hardware Input-Output (I/O) Function requirements, all DDC Hardware must also meet any additional requirements for the application in which it is used (e.g. scheduling, alarming, trending, etc.).

l. It must meet FCC Part 15 requirements and have UL 916 or equivalent safety listing.

m. Device must support Commandable Objects to support Override requirements as detailed in PART 3 EXECUTION

n. User interfaces which allow for modification of Properties or settings must be password-protected.

o. Devices communicating BACnet MS/TP must meet the following requirements:

(1) Must have a configurable Max_Master Property.

(2) DDC Hardware other than hardware controlling a single terminal unit must have a configurable Max_Info_Frames Property.

(3) Must respond to any valid request within 50 msec with either the appropriate response or with a response of "Reply Postponed".

(4) Must use twisted pair with reference and shield (3-wire media)

wiring.

p. Devices communicating BACnet/IP must use UDP Port 0xBAC0. Devices with configurable UDP Ports must default to 0xBAC0.

q. All Device IDs, Network Numbers, and BACnet MAC addresses of devices must be fully configurable without limitation, except MS/TP MAC addresses may be limited by ASHRAE 135 requirements.

r. DDC Hardware controlling a single terminal unit must have:

(1) Objects (including the Device Object) with an Object Name Property of at least 8 characters in length.

(2) A configurable Device Object Name.

(3) A configurable Device Object Description Property at least 16 characters in length.

s. Except for Objects in DDC Hardware controlling a single terminal unit, all Objects (including Device Objects) must:

(1) Have a configurable Object Name Property of at least 12 characters in length.

(2) Have a configurable Object Description Property of at least 24 characters in length.

t. For programmable DDC Hardware, provide and license to the project site all programming software required to program the Hardware in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

u. For programmable DDC Hardware, provide copies of the installed application programs (all software that is not common to every controller of the same manufacturer and model) as source code compatible with the supplied programming software in accordance with Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. The submitted application program must be the complete application necessary for controller to function as installed and be sufficient to allow replacement of the installed controller with another controller of the same type.

2.3.2 Hardware Input-Output (I/O) Functions

DDC Hardware incorporating hardware input-output (I/O) functions must meet the following requirements:

2.3.2.1 Analog Inputs

DC Hardware analog inputs (AIs) must be implemented using ASHRAE 135 Analog Input Objects and perform analog to digital (A-to-D) conversion with a minimum resolution of 8 bits plus sign or better as needed to meet the accuracy requirements specified in Section 23 09 00. Signal conditioning including transient rejection must be provided for each analog input. Analog inputs must be capable of being individually calibrated for zero and span. Calibration via software scaling performed as part of point configuration is acceptable. The AI must incorporate common mode noise rejection of at least 50 dB from 0 to 100 Hz for differential inputs, and normal mode noise rejection of at least 20 dB at

60 Hz from a source impedance of 10,000 ohms.

2.3.2.2 Analog Outputs

DDC Hardware analog outputs (AOs) must be implemented using ASHRAE 135 Analog Output Objects and perform digital to analog (D-to-A) conversion with a minimum resolution of 8 bits plus sign, and output a signal with a range of 4-20 mAdc or 0-10 Vdc. Analog outputs must be capable of being individually calibrated for zero and span. Calibration via software scaling performed as part of point configuration is acceptable. DDC Hardware with Hand-Off-Auto (H-O-A) switches for analog outputs must provide for overriding the output through the range of 0 percent to 100 percent

2.3.2.3 Binary Inputs

DDC Hardware binary inputs (BIs) must be implemented using ASHRAE 135 Binary Input Objects and accept contact closures and must ignore transients of less than 5 milli-second duration. Protection against a transient 50VAC must be provided.

2.3.2.4 Binary Outputs

DDC Hardware binary outputs (BOs) must be implemented using ASHRAE 135 Binary Output Objects and provide relay contact closures or triac outputs for momentary and maintained operation of output devices. DDC Hardware with H-O-A switches for binary outputs must provide for overriding the output open or closed.

2.3.2.4.1 Relay Contact Closures

Closures must have a minimum duration of 0.1 second. Relays must provide at least 180V of isolation. Electromagnetic interference suppression must be provided on all output lines to limit transients to 50 Vac. Minimum contact rating must be 0.5 amperes at 24 Vac.

2.3.2.4.2 Triac Outputs

Triac outputs must provide at least 180 V of isolation. Minimum contact rating must be 0.5 amperes at 24 Vac.

2.3.2.5 Pulse Accumulator

DDC Hardware pulse accumulators must be implemented using either an ASHRAE 135 Accumulator Object or an ASHRAE 135 Analog Value Object where the Present_Value is the totalized pulse count. Pulse accumulators must accept contact closures, ignore transients less than 5 msec duration, protect against
transients of 50 VAC, and accept rates of at least 20 pulses per second.

2.3.2.6 ASHRAE 135 Objects for Hardware Inputs and Outputs

The requirements for use of ASHRAE 135 objects for hardware input and outputs includes devices where the hardware sensor or actuator is integral to the controller (e.g. a VAV box with integral damper actuator, a smart sensor, a VFD, etc.)

2.3.3 Local Display Panel (LDP)

The Local Display Panels (LDPs) must be DDC Hardware with a display and navigation buttons or a touch screen display, and must provide display and adjustment of ASHRAE 135 Properties as indicated on the Points Schedule and as specified. LDPs must be either BTL Listed as a B-OD, B-OWS, B-AWS, or be an integral part of another piece of DDC Hardware listed as a B-BC. For LDPs listed as B-OWS or B-AWS, the hardware must be BTL listed and the product must come factory installed with all applications necessary for the device to function as an LDP.

The adjustment of values using display and navigation buttons must be password protected.

2.3.4 Expansion Modules and Tethered Hardware

A single piece of DDC Hardware may consist of a base unit and also:

a. An unlimited number of hardware expansion modules, where the individual hardware expansion modules are designed to directly connect, both mechanically and electrically, to the base unit hardware. The expansion modules must be commercially available as an optional add-on to the base unit.

b. A single piece of hardware connected (tethered) to a base unit by a single cable where the cable carries a proprietary protocol between the base unit and tethered hardware. The tethered hardware must not contain control logic and be commercially available as an optional add-on to the base unit as a single package.

   Note that this restriction on tethered hardware does not apply to sensors or actuators using standard binary or analog signals (not a communications protocol); sensors or actuators using standard binary or analog signals are not considered part of the DDC Hardware.

Hardware capable of being installed stand-alone, or without a separate base unit, is DDC Hardware and must not be used as expansion modules or tethered hardware.

2.3.5 Supervisory Control Requirements

2.3.5.1 Alarm Generation Hardware

DDC Hardware used for alarm generation must meet the following requirements:

a. Device must support the AE-N-I-B BIBB

b. The Recipient_List Property must be Writable for all Notification Class Objects used for alarm generation.

c. For all Objects implementing Intrinsic Alarming, the following Properties must be Writable:

   (1) Time_Delay
   (2) High_Limit
   (3) Low_Limit

(4) Deadband
(5) Event_Enable
(6) If the issue date of this project specification is after 1 January 2016, Time_Delay_Normal must be writable.

PART 3 EXECUTION

3.1 CONTROL SYSTEM INSTALLATION3.1.1 Building Control Network (BCN)

Install the Building Control Network (BCN) as a single BACnet Internetwork consisting of a single IP network as the BCN Backbone and zero or more BACnet MS/TP networks. Note that in some cases there may only be a single device on the BCN Backbone.

Except as permitted for the non-BACnet side of Gateways, use exclusively ASHRAE 135 networks.

3.1.1.1 Building Control Network IP Backbone

Install IP Network Cabling in conduit. Install Ethernet Switches in lockable enclosures. Install the Building Control Network (BCN) IP Backbone such that it is available at the Facility Point of Connection (FPOC) location . When the FPOC location is a room number, provide sufficient additional media to ensure that the Building Control Network (BCN) IP Backbone can be extended to any location in the room.

Use UDP port 0xBAC0 for all BACnet traffic on the IP network.

3.1.1.2 BACnet MS/TP Networks

When using MS/TP, provide MS/TP networks in accordance with ASHRAE 135 and in accordance with the ASHRAE 135 figure "Mixed Devices on 3-Conductor Cable with Shield" (Figure 9-1.4 in the 2012 version of ASHRAE 135). Ground the shield at the BACnet Router and at no other point. Ground the reference wire at the BACnet Router through a 100 ohm resistor and do not ground it at any other point. In addition:

a. Provide each segment in a doubly terminated bus topology in accordance with TIA-485.

b. Provide each segment with 2 sets of network bias resistors in accordance with ASHRAE 135, with one set of resistors at each end of the MS/TP network.

c. Use 3 wire (twisted pair and reference) with shield media for all MS/TP media installed inside. Use fiber optic isolation in accordance with ASHRAE 135 for all MS/TP media installed outside buildings, or between multiple buildings.

d. For 18 AWG cable, use segments with a maximum length of 4000 ft. When using greater distances or different wire gauges comply with the electrical specifications of TIA-485.

e. For each controller that does not use the reference wire provide transient suppression at the network connection of the controller if the controller itself does not incorporate transient suppression.

f. Install no more than 32 devices on each MS/TP segment. Do not use MS/TP to MS/TP routers.

g. Connect each MS/TP network to the BCN backbone via a BACnet Router.

h. For BACnet Routers, configure the MS/TP MAC address to 0. Assign MAC Addresses to other devices consecutively beginning at 1, with no gaps.

i. Configure the Max_Master Property of all devices to be 31.

3.1.1.3 Building Control Network (BCN) Installation

Provide a building control network meeting the following requirements:

a. Install all DDC Hardware connected to the Building Control Network.

b. Where multiple pieces of DDC Hardware are used to execute one sequence, install all DDC Hardware executing that sequence on a single MS/TP network dedicated to that sequence.

c. Traffic between BACnet networks must be exclusively via BACnet routers.

3.1.2 DDC Hardware

Install all DDC Hardware that connects to an IP network in lockable enclosure. Install other DDC Hardware that is not in suspended ceilings in lockable enclosures. For all DDC hardware with a user interface, coordinate with site to determine proper passwords and configure passwords into device.

a. Except for zone sensors (thermostats), install all Tethered Hardware within 6 feet of its base unit.

b. Install and configure all BTL-Listed devices in a manner consistent with their BTL Listing such that the device as provided still meets all requirements necessary for its BTL Listing.

c. Install and configure all BTL-Listed devices in a manner consistent with the BTL Device Implementation Guidelines such that the device as provided meets all those Guidelines.

3.1.2.1 Device Identifiers, Network Addresses, and IP addresses

a. Do not use any Device Identifier or Network Number already used by another BACnet system at the project site. Coordinate Device IDs and Network Numbers with the installation. .

b. Coordinate device IP addresses with installation..

3.1.2.2 Object Name Property and Object Description Property

Configure the Object_Names and Object_Descriptions properties of all Objects (including Device Objects) as indicated on the Points Schedule (Point Name and Point Description) and as specified. At a minimum:

a. Except for DDC Hardware controlling a single terminal unit, configure the Object_Name and Object_Description properties of all Objects (including Device Objects) as indicated on the Points Schedule and as specified.

b. In DDC Hardware controlling a single terminal unit, configure the Device Object_Name and Device Object_Description as indicated on the Points Schedule and as specified.

When Points Schedule entries exceed the length limitations in the device, provide recommended alternatives for approval.

3.1.2.3 Local Display Panels

Provide LDPs to display and override values of ASHRAE 135 Object Properties as indicated on the Points Schedule. Install LDPs displaying points for anything other than a terminal unit in the same room as the equipment. Install LDPs displaying points for only terminal units in a mechanical room central to the group of terminal units it serves. For LDPs using WriteProperty to commandable objects to implement an override, write values with priority 9.

3.1.2.4 MS/TP Slave Devices

Configure all MS/TP devices as Master devices. Do not configure any devices to act as slave devices.

3.1.2.5 Change of Value (COV) and Read Property

a. To the greatest extent possible, configure all devices to support the SubscribeCOV service (the DS-COV-B BIBB). At a minimum, all devices supporting the DS-RP-B BIBB, other than devices controlling only a single terminal unit, must be configured to support the DS-COV-B BIBB.

b. Whenever supported by the server side, configure client devices to use the DS-COV-A BIBB.

3.1.2.6 Engineering Units

Configure devices to use English (Inch-Pound) engineering units as follows:

a. Temperature in degrees F

b. Air or natural gas flows in cubic feet per minute (CFM)

c. Water in gallons per minute (GPM)

d. Steam flow in pounds per hour (pph)

e. Differential Air pressures in inches of water column (IWC)

f. Water, steam, and natural gas pressures in PSI

g. Enthalpy in BTU/lb

h. Heating and cooling energy in MBTU (1MBTU = 1,000,000 BTU))

i. Cooling load in tons (1 ton = 12,000 BTU/hour)

j. Heating load in MBTU/hour (1MBTU = 1,000,000 BTU)

k. Electrical Power: kilowatts (kW)

l. Electrical Energy: kilowatt-hours (kWh)

3.1.2.7 Occupancy Modes

Use the following correspondence between value and occupancy mode whenever an occupancy state or value is required:

a. OCCUPIED mode: a value of one
b. UNOCCUPIED mode: a value of two
c. WARM-UP/COOL-DOWN (PRE-OCCUPANCY) mode: a value of three

Note that elsewhere in this Section the Schedule Object is required to also support a value of four, which is reserved for future use. Also note that the behavior of a system in each of these occupancy modes is indicated in the sequence of operation for the system.

3.1.2.8 Use of BACnet Objects

Use only standard non-proprietary ASHRAE 135 Objects and services to accomplish the project scope of work as follows:

a. Use Analog Input or Analog Output Objects for all analog hardware I/O. Do not use Analog Value Object for analog hardware I/O) .

b. Use Binary Input or Binary Output Objects for all binary hardware I/O. Do not use Binary Value Objects for binary hardware I/O.

c. Use Analog Value Objects for analog setpoints.

d. Use Accumulator Objects or Analog Value Objects for pulse inputs.

e. For occupancy modes, use Multistate Value Objects and the correspondence between value and occupancy mode specified in paragraph OCCUPANCY MODES.

g. For all other points shown on the Points Schedule as requiring an ASHRAE 135 Object, use the Object type shown on the Points Schedule or, if no Object Type is shown, use a standard Object appropriate to the point.

3.1.2.9 Use of Standard BACnet Services

Except as noted in this paragraph, for all DDC Hardware use Standard BACnet Services as defined in this specification (which excludes some ASHRAE 135 services) exclusively for application control functionality and communication.

DDC Hardware that cannot meet this requirement may use non-standard services provided they can provide identical functionality using Standard BACnet Services when communicating with BACnet devices from a different vendor. When implementing non-standard services, document all non-standard services in the DDC Hardware Schedule as specified and as specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

3.1.2.10 Device Application Configuration

a. For every property, setting or value shown on the Points Schedule or

otherwise indicated as Configurable, provide a value that is retained through loss of power and can be changed via one or more of:

(1) BACnet services (including proprietary services)

(2) Hardware settings on the device

b. For every property, setting or value shown on the Points Schedule or otherwise indicated as Operator Configurable, provide a value that is retained through loss of power and can be changed via one or more of:

(1) A Writable Property of a standard BACnet Object

(2) A Property of a standard BACnet Object that is Writable when Out_Of_Service is TRUE and Out_Of_Service is Writable.

3.1.3 Scheduling, Alarming, Trending, and Overrides

3.1.3.1 Scheduling

Provide a separate schedule for each AHU including it's associated Terminal Units and for each stand-alone Terminal Unit (those not dependent upon AHU service) or group of stand-alone Terminal Units acting according to a common schedule.

3.1.3.2 Configuration of Alarm Generation

a. Send alarm events as Alarms (not Events).

b. Use the ConfirmedNotification Service for alarm events.

c. For alarm generation, support two priority levels for alarms: critical and non-critical. Configure the Priority of Notification Class Objects to use Priority 112 for critical and 224 for non-critical alarms.

d. Number of Notification Class Objects for Alarm Generation:

(1) If the device implements non-critical alarms, or if any Object in the device supports Intrinsic Alarms, then provide a single Notification Class Object specifically for (shared by) all non-critical alarms.

(2) If the device implements critical alarms, provide a single Notification Class Object specifically for (shared by) all critical alarms.

(3) If the device implements both critical and non-critical alarms, provide both Notification Class Objects (one for critical, one for non-critical).

(4) If the device controls equipment other than a single terminal unit, provide both Notification Class Objects (one for critical,

one for non-critical) even if no alarm generation is required at time of installation.

e. For all intrinsic alarms configure the Limit_Enable Property to set both HighLimitEnable and LowLimitEnable to TRUE. If the specified alarm conditions are for a single-sided alarm (only High_Limit used or only Low_Limit used) assign a value to the unused limit such that the unused alarm condition will not occur.

f. For all objects supporting intrinsic alarming, even if no alarm generation is required during installation, configure the following Properties as follows:

(1) Notification_Class to point to the non-Critical Notification Class Object in that device.

(2) Limit_Enable to enable both the HighLimitEnable and LowLimitEnable

(3) Notify_Type to Alarm

3.1.3.3 Overrides

Provide an override for each point shown on the Points Schedule as requiring an override.

Unless otherwise approved, provide Commandable Objects to support all Overrides . With specific approval from the Contracting Officer, Overrides for points which are not hardware outputs and which are in DDC hardware controlling a single terminal unit may support overrides via an additional Object provided for the override. No other means of implementing Overrides may be used.

a. Where Commandable Objects are used, ensure that WriteProperty service requests with a Priority of 10 or less take precedence over the SEQUENCE VALUE and that WriteProperty service request with a priority of 11 or more have a lower precedence than the SEQUENCE VALUE.

b. For devices implementing overrides via additional Objects, provide Objects which are NOT Written to as part of the normal Sequence of Operations and are Writable when Out_Of_Service is TRUE and Out_Of_Service is Writable. Use this point as an Override of the normal value when Out_Of_Service is TRUE and the normal value otherwise. Note these Objects may be modified as part of the sequence via local processes, but must not be modified by local processes when Out_Of_Service is TRUE.

3.1.4 BACnet Gateways

The requirements in this paragraph do not themselves permit the installation of hardware not meeting the other requirements of this section. Except for proprietary systems specifically indicated in Section 23 09 00, all control hardware installed under this project must meet the requirements of this specification, including the control hardware providing the network interface for a package unit or split system specified under another section. Only use gateways to connect to

pre-existing control devices, and to proprietary systems specifically permitted by Section 23 09 00.

3.1.4.1 General Gateway Requirements

Provide BACnet Gateways to connect non-BACnet control hardware in accordance with the following:

a. Configure gateways to map writable data points in the controlled equipment to Writable Properties of Standard Objects as indicated in the Points Schedule and as specified.

b. Configure gateway to map readable data points in the controlled equipment to Readable Properties of Standard Objects as indicated in the Points Schedule and as specified.

c. Configure gateway to support the DS-COV-B BIBB for all points mapped to BACnet Objects.

d. Do not use non-BACnet control hardware for controlling built-up units or any other equipment that was not furnished with factory-installed controls.

e. Do not use non-BACnet control hardware for system scheduling functions.

f. Each gateway must communicate with and perform protocol translation for non-BACnet control hardware controlling one and only one package unit or a single non-BACnet system specifically permitted by Section 23 09 00.

g. Connect one network port on the gateway to the Building Control Backbone IP Network or to a BACnet MS/TP network and the other port to the single piece of controlled equipment or the non-BACnet system specifically permitted by Section 23 09 00..

h. For gateways to existing package units or simple split systems, non-BACnet network wiring connecting the gateway to the package unit must not exceed 10 feet in length and must connect to exactly two devices: the controlled equipment (packaged unit) or split system interface and the gateway.

-- End of Section --

SECTION 23 23 00

REFRIGERANT PIPING
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.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 710 I-P	(2009) Performance Rating of Liquid-Line Driers
AHRI 720	(2002) Refrigerant Access Valves and Hose Connectors
AHRI 750 I-P	(2016) Performance Rating of Thermostatic Refrigerant Expansion Valves
AHRI 760 I-P	(2014) Performance Rating of Solenoid Valves for Use with Volatile Refrigerants
AHRI 1370 I-P	(2017) Performance Rating of Electronic Expansion Valves

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

ASHRAE 15 & 34	(2013) ASHRAE Standard 34-2016 Safety Standard for Refrigeration Systems/ASHRAE Standard 34-2016 Designation and Safety Classification of Refrigerants-ASHRAE Standard 34-2016
ASHRAE 17	(2015) Method of Testing Capacity of Thermostatic Refrigerant Expansion Valves
ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.22	(2021) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(2018) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B31.1	(2024) Power Piping
ASME B31.5	(2022) Refrigeration Piping and Heat Transfer Components

ASME B40.100	(2022) Pressure Gauges and Gauge Attachments

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2019) Specification for Filler Metals for Brazing and Braze Welding
AWS A5.31/A5.31M	(2012) Specification for Fluxes for Brazing and Braze Welding
AWS BRH	(2007; 5th Ed) Brazing Handbook
AWS Z49.1	(2021) Safety in Welding and Cutting and Allied Processes

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B62	(2017) Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B75/B75M	(2020) Standard Specification for Seamless Copper Tube
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B280	(2020) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B813	(2024) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM D520	(2000; R 2011) Zinc Dust Pigment
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Refrigerant Piping System;

SD-03 Product Data

Refrigerant Piping System

Qualifications

Refrigerant Piping Tests

SD-06 Test Reports

Refrigerant Piping Tests

SD-07 Certificates

Service Organization

SD-10 Operation and Maintenance Data

Maintenance;

Operation and Maintenance Manuals;

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

Submit 4 copies of qualified procedures, and list of names and identification symbols of qualified welders and welding operators, prior to non-factory welding operations.

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 must include applications of equipment and materials under similar circumstances and of similar size. The 2 years' experience must 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 must be supported by a service organization. System components must 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 must 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. Exposed equipment moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel must be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Install safety devices so that proper operation of equipment is not impaired. Welding and cutting safety requirements must be in accordance with AWS Z49.1.

e. Provide the manufacturer's standard catalog data, at least 5 weeks prior to the purchase or installation of a particular component. Highlight the data to show information such as, but not limited to, material, size, options, performance charts, and curves in adequate detail to demonstrate compliance with contract requirements. Include the manufacturer's recommended installation instructions and procedures in the data provided. 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

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, must be provided.

2.3 REFRIGERANT PIPING SYSTEM

Provide refrigerant piping, valves, fittings, and accessories in accordance with ASHRAE 15 & 34 and ASME B31.5, except as specified herein. Refrigerant piping, valves, fittings, and accessories must 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 must be cleaned, dehydrated, and sealed (capped or plugged) prior to shipment from the manufacturer's plant. Submit drawings, at least 5 weeks prior to beginning construction, provided in adequate detail to demonstrate compliance with contract requirements. Drawings must 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

Provide copper tubing conforming to ASTM B280 annealed or hard drawn as required. Copper tubing must bear the product identification markings in accordance with ASTM B280, "ACR" must be present on copper tubing. Copper tubing must be soft annealed where bending is required and hard drawn where no bending is required. Soft annealed copper tubing must not be used in sizes larger than 1-3/8 inches. Joints must be brazed except that joints on lines 7/8 inchand smaller may be flared. Cast copper alloy fittings for flared copper tube must conform to ASME B16.26 and ASTM B62. Wrought copper and bronze solder-joint pressure fittings must conform to ASME B16.22 and ASTM B75/B75M. Joints and fittings for brazed joint must be wrought-copper or forged-brass sweat fittings. Cast sweat-type joints and fittings are not 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 must conform to ASTM B32, grade Sb5, tin-antimony alloy for service pressures up to 150 psig. Solder flux must be liquid or paste form, non-corrosive and conform to ASTM B813.

2.4.3 Brazing Filler Metal

Filler metal must conform to AWS A5.8/A5.8M, Type BAg-5 with AWS Type FB3-A or Type FB3-C flux, except Type BCuP-3, BCuP-4, or BCuP-5 may be used for brazing copper-to-copper joints. BAlSi-4 with AWS Type FB1-A flux may be used when joining copper piping to aluminum components.

2.4.4 Brazing Flux

Brazing flux must conform to AWS A5.31/A5.31M, Type FB3-A or Type FB3-C

when using Type BAg-5 filler metal. Type FB1-A is to be used with Type BAlSi-4 filler metal.

2.4.5 Press Fittings

Press fittings are not acceptable for use in refrigerant piping systems.

2.5 VALVES

Valves must be designed, manufactured, and tested specifically for refrigerant service. The valve material and all internal components must be compatible with the specific refrigerant and lubricant used. Valve bodies must be of brass or bronze construction. Valves 1 inch and smaller must have brazed or socket welded connections. Do not use threaded end connections, except in pilot pressure or gauge lines where maintenance disassembly is required and welded flanges cannot be used. Internal parts must be removable for inspection or replacement without applying heat or breaking pipe connections. Valve stems exposed to the atmosphere must be stainless steel or corrosion resistant metal plated carbon steel. Direction of flow must be legibly and permanently indicated on the valve body. Control valve inlets must be fitted with integral or adapted strainer or filter where recommended or required by the manufacturer. Purge, charge and receiver valves must be of manufacturer's standard configuration.

2.5.1 Refrigerant Stop Valves

Valve must be the globe or full-port ball type with a back-seating stem especially packed for refrigerant service. Valve packing must be replaceable under line pressure. Provide valve with a wrench operator and a seal cap. Valve must be the straight or angle pattern design as indicated.

2.5.2 Check Valves

Valve must be the swing or lift type as required to provide positive shutoff at the differential pressure indicated. Valve must be provided with resilient seat.

2.5.3 Liquid Solenoid Valves

Provide valves that comply with AHRI 760 I-P and are suitable for continuous duty with applied voltages 15 percent under and 5 percent over nominal rated voltage at maximum and minimum encountered pressure and temperature service conditions. Valves must be direct-acting or pilot-operating type, packless, except that packed stem, seal capped, manual lifting provisions must be furnished. Provide solenoid coils that are moisture-proof, UL approved, totally encapsulated or encapsulated and metal jacketed as required. Valves must have safe working pressure of 610 psi and a maximum operating pressure differential of at least 200 psi at 85 percent rated voltage. Valves must have an operating pressure differential suitable for the refrigerant used.

2.5.4 Expansion Valves

Provide valve conforming to AHRI 750 I-P and ASHRAE 17. Valve must be the diaphragm and spring-loaded type with internal or external equalizers, and bulb and capillary tubing. Provide valve with an external superheat adjustment along with a seal cap. Internal equalizers may be utilized

where flowing refrigerant pressure drop between outlet of the valve and inlet to the evaporator coil is negligible and pressure drop across the evaporator is less than the pressure difference corresponding to 2 degrees F of saturated suction temperature at evaporator conditions. Bulb charge must be determined by the manufacturer for the application and such that liquid will remain in the bulb at all operating conditions. Do not use gas limited liquid charged valves and other valve devices for limiting evaporator pressure without a distributor or discharge tube or effective means to prevent loss of control when bulb becomes warmer than valve body. Pilot-operated valves must have a characterized plug to provide required modulating control. A de-energized solenoid valve may be used in the pilot line to close the main valve in lieu of a solenoid valve in the main liquid line. Provide an isolatable pressure gauge in the pilot line, at the main valve. Automatic pressure reducing or constant pressure regulating expansion valves may be used only where indicted or for constant evaporator loads.

2.5.5 Electronic Expansion Valves

Valve must conform to AHRI 1370 I-P and ASHRAE 17. The valve must prevent the return of liquid to the compressor in the event of power loss or low superheat.

2.5.6 Safety Relief Valves

Valve must be the two-way type, unless indicated otherwise. Valve must bear the ASME code symbol. Valve capacity must be certified by the National Board of Boiler and Pressure Vessel Inspectors. Valve must be of an automatically reseating design after activation.

2.5.7 Evaporator Pressure Regulators, Direct-Acting

Valve must include a diaphragm/spring assembly, external pressure adjustment with seal cap, and pressure gauge port. Valve must maintain a constant inlet pressure by balancing inlet pressure on diaphragm against an adjustable spring load. Pressure drop at system design load must not exceed the pressure difference corresponding to a 2 degrees F change in saturated refrigerant temperature at evaporator operating suction temperature. Spring must be selected for indicated maximum allowable suction pressure range.

2.5.8 Refrigerant Access Valves

Provide refrigerant access valves and hose connections in accordance with AHRI 720.

2.6 PIPING ACCESSORIES

2.6.1 Filter Driers

Driers must conform to AHRI 710 I-P. Sizes 5/8 inch and larger must be the full flow, replaceable core type. Sizes 1/2 inch and smaller must be the sealed type. Cores must be of suitable desiccant that will not plug, cake, dust, channel, or break down, and must remove water, acid, and foreign material from the refrigerant. Constructfilter driers so that none of the desiccant will pass into the refrigerant lines. Minimum bursting pressure must be 1,500 psi.

2.6.2 Sight Glass and Liquid Level Indicator

2.6.2.1 Assembly and Components

Assembly must be pressure- and temperature-rated and constructed of materials suitable for the service. Glass must be borosilicate type. Ferrous components subject to condensation must be electro-galvanized.

2.6.2.2 Gauge Glass

Gauge glass must include top and bottom isolation valves fitted with automatic checks, and packing followers; red-line or green-line gauge glass; elastomer or polymer packing to suit the service; and gauge glass guard.

2.6.2.3 Bull's-Eye and Inline Sight Glass Reflex Lens

Provide bull's-eye and inline sight glass reflex lens for dead-end liquid service. For pipe line mounting, provide two plain lenses in one body suitable for backlighted viewing.

2.6.2.4 Moisture Indicator

Indicator must be a self-reversible action, moisture reactive, color changing media. Indicator must be furnished with full-color-printing tag containing color, moisture, and temperature criteria. Unless otherwise indicated, the moisture indicator must be an integral part of each corresponding sight glass.

2.6.3 Vibration Dampeners

Dampeners must be of the all-metallic bellows and woven-wire type.

2.6.4 Flexible Pipe Connectors

Connector must be a composite of interior corrugated phosphor bronze or Type 300 Series stainless steel, as required for fluid service, with exterior reinforcement of bronze, stainless steel or monel wire braid. Assembly must be constructed with a safety factor of not less than 4 at300 degrees F. Unless otherwise indicated, the length of a flexible connector must be as recommended by the manufacturer for the service intended.

2.6.5 Strainers

Strainers used in refrigerant service must have brass or cast-iron body, Y-or angle-pattern, cleanable, not less than 60-mesh noncorroding screen of an area to provide net free area not less than ten times the pipe diameter with pressure rating compatible with the refrigerant service. Screens must be stainless steel or monel and reinforced spring-loaded where necessary for bypass-proof construction.

2.6.6 Pressure and Vacuum Gauges

Provide gauges conforming to ASME B40.100 with throttling type needle valve or a pulsation dampener and shut-off valve. Gauge must be a minimum of 3-1/2 inches in diameter with a range from 0 psig to approximately 1.5 times the maximum system working pressure. Select each gauge range so that at normal operating pressure, the needle is within the middle-third of the range.

2.6.7 Pipe Hangers, Inserts, and Supports

Provide pipe hangers, inserts, guides, and supports conforming to MSS SP-58.

2.6.8 Escutcheons

Escutcheons must be chromium-plated iron or chromium-plated brass, either one piece or split pattern, held in place by internal spring tension or set screws.

2.7 FABRICATION

2.7.1 Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, must be factory finished with the manufacturer's standard finish, except that items located outside of buildings must have weather resistant finishes that will withstand 3000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen must show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used must be coated with a zinc-rich coating conforming to ASTM D520, Type I.

2.7.2 Factory Applied Insulation

Factory installed insulation must be in accordance with ASHRAE 90.1 - IP. Refrigerant suction lines between the cooler and each compressor must be insulated with not less than 1/2 inch thick unicellular plastic foam. Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors must have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces must have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes must be determined by ASTM E84. Test insulation in the same density and installed thickness as the material to be used in the actual construction. Test material supplied by a manufacturer with a jacket as a composite material. Provide jackets, facings, and adhesives that have a flame spread index less than 25 and a smoke developed index less than 50 when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.1 INSTALLATION

Pipe and fitting installation must conform to the requirements of ASME B31.1. 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 is not permitted without written approval. Cut pipe or tubing square, remove by reaming, and permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers.

3.1.1 Directional Changes

Make changes in direction with fittings, except that bending of pipe 4 inches and smaller is 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 must not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be accepted.

3.1.2 Functional Requirements

Install piping 1/2 inch/10 feet of pipe in the direction of flow to ensure adequate oil drainage. Properly cap or plug open ends of refrigerant lines or equipment during installation to keep moisture, dirt, or other foreign material out of the system. Piping must remain capped until installation. Equipment piping must be in accordance with the equipment manufacturer's recommendations and the contract drawings. Equipment and piping arrangements must fit into space allotted and allow adequate acceptable clearances for installation, replacement, entry, servicing, and maintenance.

3.1.3 Fittings and End Connections

3.1.3.1 Brazed Connections

Perform brazing in accordance with AWS BRH, 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 on copper-to-copper connections. 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.

3.1.4 Valves

3.1.4.1 General

Install refrigerant stop valves on each side of each piece of equipment such as compressors condensers, evaporators, receivers, and other similar items in multiple-unit installation, to provide partial system isolation as required for maintenance or repair. Install stop valves with stems horizontal unless otherwise indicated. Install ball valves must be installed with stems positioned to facilitate operation and maintenance. Isolating valves for pressure gauges and switches must be external to thermal insulation. Safety switches must not be fitted with isolation valves. Filter dryers having access ports may be considered a point of isolation. Purge valves must be provided at all points of systems where accumulated non-condensable gases would prevent proper system operation. Valves must be furnished to match line size, unless otherwise indicated or approved.

3.1.4.2 Expansion Valves

Install expansion valves with the thermostatic expansion valve bulb located on top of the suction line when the suction line is less than 2-1/8 inches in diameter and at the 4 o'clock or 8 o'clock position on lines larger than 2-1/8 inches. Fasten the bulb securely with two clamps. Insulate ehe bulb . Install the bulb in a horizontal portion of the suction line, if possible, with the pigtail on the bottom. If the bulb must be installed in a vertical line, the bulb tubing must be facing up.

3.1.4.3 Valve Identification

Tag each system valve, including those which are part of a factory assembly. Tags must be in alphanumeric sequence, progressing in direction of fluid flow. Tags must be embossed, engraved, or stamped plastic or nonferrous metal of various shapes, sized approximately 1-3/8 inch diameter, or equivalent dimension, substantially attached to a component or immediately adjacent thereto.

3.1.5 Vibration Dampers

Provide vibration damper in the suction and discharge lines on spring mounted compressors. Install vibration dampers parallel with the shaft of the compressor and anchor firmly at the upstream end on the suction line and the downstream end in the discharge line.

3.1.6 Strainers

Provide strainers immediately ahead of solenoid valves and expansion devices. Strainers may be an integral part of an expansion valve.

3.1.7 Filter Dryer

Provide a liquid line filter dryer on each refrigerant circuit located such that all liquid refrigerant passes through a filter dryer. Size dryers in accordance with the manufacturer's recommendations for the system in which it is installed. Install dryers such that it can be isolated from the system, the isolated portion of the system evacuated, and the filter dryer replaced. Install dryers in the horizontal position except replaceable core filter dryers may be installed in the vertical position with the access flange on the bottom.

3.1.8 Sight Glass

Install a moisture indicating sight glass in all refrigerant circuits down stream of all filter dryers and where indicated. Provide full line size sight glasses.

3.1.9 Discharge Line Oil Separator

Provide discharge line oil separator in the discharge line from each compressor. Connect the oil return line to the compressor as recommended by the compressor manufacturer.

3.1.10 Accumulator

Provide accumulators in the suction line to each compressor.

3.1.11 Flexible Pipe Connectors

Install connectors perpendicular to line of motion being isolated. Fit piping for equipment with bidirectional motion with two flexible connectors, in perpendicular planes. Install reinforced elastomer flexible connectors in accordance with manufacturer's instructions. Provide piping guides and restraints related to flexible connectors as required.

3.1.12 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts, and supports must conform to MSS SP-58, except as modified herein. Do not use pipe hanger types 5, 12, and 26. Fabricate hangers used to support piping 2 inches and larger to permit adequate adjustment after erection while still supporting the load. Support piping subjected to vertical movement, when operating temperatures exceed ambient temperatures, by variable spring hangers and supports or by constant support hangers.

3.1.12.1 Hangers

Do not use Type 3 on insulated piping. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

3.1.12.2 Inserts

Secure Type 18 inserts to concrete forms before concrete is placed. Continuous inserts which allow more adjustments may be used if they otherwise meet the requirements for Type 18 inserts.

3.1.12.3 C-Clamps

Torque Type 19 and 23 C-clamps in accordance with MSS SP-58 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

3.1.12.4 Angle Attachments

Furnish Type 20 attachments used on angles and channels with an added malleable-iron heel plate or adapter.

3.1.12.5 Saddles and Shields

Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application, the Type 39 saddle, connected to the pipe, must be used on all pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Use Type 40 shields on all piping less than 4 inches and all piping 4 inches and larger carrying medium less than 60 degrees F. Use a high-density insulation insert of cellular glass under the Type 40 shield for piping 2 inches and larger.

3.1.12.6 Horizontal Pipe Supports

Space horizontal pipe supports as specified in MSS SP-58 and install a support no more than 1 foot from the pipe fitting joint at each change in direction of the piping. Space pipe supports no more than 5 feet apart at valves. Pipe hanger loads suspended from steel joist with hanger loads between panel points in excess of 50 pounds must have the excess hanger loads suspended from panel points.

3.1.12.7 Vertical Pipe Supports

Support vertical pipe at each floor, except at slab-on-grade, and at intervals of not more than 15 feet not more than 8 feet from end of risers, and at vent terminations.

3.1.12.8 Pipe Guides

Provide Type 35 guides using, steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides where required to allow longitudinal pipe movement. Provide lateral restraints as required. Provide slide materials that are suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.

3.1.12.9 Steel Slides

Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 4 inches and larger, usea Type 39 saddle. On piping under 4 inches, a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate.

3.1.12.10 High Temperature Guides with Cradles

Where there are high system temperatures and welding to piping is not desirable, the Type 35 guide must include a pipe cradle, welded to the guide structure and strapped securely to the pipe. Separate the pipe from the slide material by at least 4 inches, or by an amount adequate for the insulation, whichever is greater.

3.1.12.11 Multiple Pipe Runs

In the support of multiple pipe runs on a common base member, use a clip or clamp where each pipe crosses the base support member. Spacing of the base support members must not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run.

3.1.12.12 Structural Attachments

Attachment to building structure concrete and masonry must be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors must be applied with a safety factor not less than 5. Do not attach supports to metal decking. Construct masonry anchors for overhead applications of ferrous materials only. Provide structural steel brackets required to support piping, headers, and equipment, but not shown, under this section. Specify material used for support under Section 05 40 00 COLD-FORMED METAL FRAMING.

3.1.13 Pipe Alignment Guides

Provide pipe alignment guides where indicated for expansion loops, offsets, and bends and as recommended by the manufacturer for expansion joints, not to exceed 5 feet on each side of each expansion joint, and in lines 4 inches or smaller not more than 2 feet on each side of the joint.

3.1.14 Pipe Anchors

Provide anchors wherever necessary or indicated to localize expansion or

to prevent undue strain on piping. Provide anchors consisting of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Install anchor braces in the most effective manner to secure the desired results using turnbuckles where required. Do not attach supports, anchors, or stays 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, immediately anchor these items adjacent to each penetrated surface, to provide essentially zero movement within penetration seal. Submit detailed drawings of pipe anchors for approval before installation.

3.1.15 Building Surface Penetrations

Do not install sleeves in structural members except where indicated or approved. Provide galvanized sheet metal sleeves in non-load bearing surfaces conforming to ASTM A653/A653M, Coating Class G-90, 20 gauge. Provide uncoated carbon steel pipe sleeves in load bearing surfaces conforming to ASTM A53/A53M, Standard weight. Apply sealants to moisture and oil-free surfaces and elastomers to not less than 1/2 inch depth. Do not install sleeves in structural members.

3.1.15.1 General Service Areas

Extend each sleeve through its respective wall, floor, or roof, and cut flush with each surface. Provide pipes passing through concrete or masonry wall or concrete floors or roofs with pipe sleeves fitted into place at the time of construction. Provide sleeves that allow a minimum of 1/4 inch all-around clearance between bare pipe and sleeves or between jacketed-insulation and sleeves. Except in pipe chases or interior walls, seal the annular space between pipe and sleeve or between jacket over-insulation and sleeve in accordance with Section 07 92 00 JOINT SEALANTS.

3.1.15.2 Waterproof Penetrations

Install pipes passing through roof or floor waterproofing membrane through a 17 ounce copper sleeve, or a 0.032 inch thick aluminum sleeve, each within an integral skirt or flange. Form flashing sleeve, and extend skirt or flange greater than 8 inches from the pipe and set over the roof or floor membrane in a troweled coating of bituminous cement. Extend the flashing sleeve up the pipe a minimum of 2 inches above the roof or floor penetration. Seal the annular space between the flashing sleeve and the bare pipe or between the flashing sleeve and the metal-jacket-covered insulation as indicated. Seal penetrations by either one of the following methods.

3.1.15.2.1 Waterproofing Clamping Flange

Pipes up to and including 10 inches 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. Clamp waterproofing membrane into place and place sealant in the caulking recess.

3.1.15.2.2 Modular Mechanical Type Sealing Assembly

In lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve or conduit and sleeve, a modular

mechanical type sealing assembly may be installed. Provide seals consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, and pressure plates. Loosely assemble links 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, tighten the bolt to cause the rubber sealing elements to expand and provide a watertight seal between the pipe/conduit and the sleeve. Size each seal assembly as recommended by the manufacturer to fit the pipe/conduit and sleeve involved. The Contractor electing to use the modular mechanical type seals must provide sleeves of the proper diameters.

3.1.15.3 Fire-Rated Penetrations

Seal penetration of fire-rated walls, partitions, and floors as specified in Section 07 84 00.00 22 FIRESTOPPING.

3.1.15.4 Escutcheons

Provide escutcheons for finished surfaces where exposed piping, bare or insulated, pass through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Where sleeves project slightly from floors, use special deep-type escutcheons. Secure escutcheon to pipe or pipe covering.

3.1.16 Field Applied Insulation

Field installed insulation is specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS, except as defined differently herein.

3.1.17 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section 09 90 00 PAINTS AND COATINGS.

3.1.17.1 Color Coding

Color coding for piping identification is specified in Section 09 90 00 PAINTS AND COATINGS.

3.1.17.2 Color Coding Scheme

Provide a color coding scheme for locating hidden piping in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.1.18 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 must be 1-3/8 inch minimum diameter and marking must be stamped or engraved. Indentations must be black for reading clarity. Attach tags to valves with No. 12 AWG copper wire, chrome-plated beaded chain or plastic straps designed for that purpose.

3.2 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 are considered contaminated systems. Restore contaminated systems to clean condition including disassembly, component replacement, evacuation, flushing, purging, and re-charging, using currently approved refrigerant and refrigeration manufacturer's procedures. Restore contaminated systems at no additional cost to the Government as determined by the Contracting Officer. Do not use water in any procedure or test.

3.3 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 6 members of the operating staff as designated by the Contracting Officer. The training period must 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. Cover all of the items contained in the approved operation and maintenance manuals.

c. Submit 6 complete copies of an operation manual in bound 8 1/2 by 11 inch 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. Include the manufacturer's name, model number, and parts list in the booklets. Include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features in the manuals.

d. Submit 6 complete copies of maintenance manual in bound 8 1/2 x 11 inch booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. Include piping layouts and simplified wiring and control diagrams of the system as installed in the manuals.

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. Coordinate field tests with Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Submit 6 copies of the tests report in bound 8 1/2 by 11 inch booklets documenting all phases of the tests performed. Include initial test summaries, all repairs/adjustments made, and the final test results in the report.

3.4.1 Preliminary Procedures

Prior to pneumatic testing, isolate 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, from the test pressure, or remove from the system. Remove safety relief valves and rupture discs that are not part of factory sealed systems, and cap or plug openings.

3.4.2 Pneumatic Test

Provide pressure control and excess pressure protection at the source of test pressure. Valves must be wide open, except those leading to the atmosphere. Test gas must be dry nitrogen, with minus 70 degree F dewpoint and less than 5 ppm oil. Apply test pressure in two stages before any refrigerant pipe is insulated or covered. In accordance with ASME B31.5, a preliminary test not to exceed 25 psi must be applied as a means of locating major leaks. Every joint being tested must be coated with a thick soap or color indicating solution. The second stage test pressure must be at least 110 percent of the design pressure, but cannot exceed 130 percent of the design pressure of any component in the system. For large systems that are not completely visible, the pressure in the system must be gradually increased to one-half of the test pressure after which the pressure must be increased in steps of one-tenth of the test pressure, until the required test pressure has been reached. The test pressure must be continuously maintained for at leas 24 hours, after which it can be reduced to the leak test pressure. A correction factor of 0.3 psi will be allowed for each degree F change between test space initial and final ambient temperature, plus for increase and minus for a decrease. The leak test pressure must be the design pressure, or a pressure specified in the engineering design. To repair leaks, the joint must be taken apart, thoroughly cleaned, and reconstructed as a new joint. Joints repaired by caulking, re-melting, or back-welding/brazing are not acceptable. Following repair, the entire system must be retested using the pneumatic tests described above. Reassemble the entire system once the pneumatic tests are satisfactorily completed.

3.4.3 Evacuation Test

Following satisfactory completion of the pneumatic tests, relieve the pressure and evacuate the entire system to an absolute pressure of 300 micrometers. During evacuation of the system, the ambient temperature must be higher than 35 degrees F. Do not evacuate no more than one system at one time by one vacuum pump. Once the desired vacuum has been reached, close the vacuum line and allow the system to stand for 1 hour. If the pressure rises over 500 micrometers after the 1 hour period, evacuate the system again down to 300 micrometers and let set for another 1 hour period. Do not charge the system 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 rises above 500 micrometers, continue to repeat the evacuation procedures until all residual moisture has been removed. During evacuation, record pressures 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, charge the system with the required amount of refrigerant by raising pressure to

normal operating pressure and in accordance with manufacturer's procedures. Following charging, the system must operate with high-side and low-side pressures and corresponding refrigerant temperatures, at design or improved values. Test the entire system tested for leaks. Test fluorocarbon systems with halide torch or electronic leak detectors.

3.4.5 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system must be immediatelyisolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. The refrigerant must not 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 must 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 will the allowable leak rate exceed the leak rates allowed in Section 608 of the Clean Air Act: 30 percent of the full charge per year for industrial refrigeration, 20 percent of the full charge per year for commercial refrigeration, and 10 percent of the full charge per year for comfort cooling. Any system leaks within the first year must 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.

-- End of Section --

SECTION 23 30 00

HVAC AIR DISTRIBUTION
05/20, CHG 1: 02/22

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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 201	(2002; R 2011) Fans and Systems
AMCA 210	(2016) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
AMCA 300	(2014) Reverberant Room Method for Sound Testing of Fans
AMCA 301	(2014) Methods for Calculating Fan Sound Ratings from Laboratory Test Data

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 880 I-P	(2011) Performance Rating of Air Terminals
AHRI 885	(2008; Addendum 2011) Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets
AHRI Guideline D	(1996) Application and Installation of Central Station Air-Handling Units

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 9	(2015) Load Ratings and Fatigue Life for Ball Bearings
ABMA 11	(2014) Load Ratings and Fatigue Life for Roller Bearings

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

ASHRAE 62.1	(2016) Ventilation for Acceptable Indoor Air Quality
ASHRAE 70	(2006; R 2021) Method of Testing the Performance of Air Outlets and Inlets

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2024) Standard Specification for Pipe,

	Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B766	(1986; R 2015) Standard Specification for Electrodeposited Coatings of Cadmium
ASTM C553	(2013; R 2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM D520	(2000; R 2011) Zinc Dust Pigment
ASTM D1654	(2008; R 2016; E 2017) Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D3359	(2017) Standard Test Methods for Rating Adhesion by Tape Test
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E2016	(2020) Standard Specification for Industrial Woven Wire Cloth

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2021) Motors and Generators
NEMA MG 10	(2017) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2024) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 90B	(2021) Standard for the Installation of Warm Air Heating and Air Conditioning Systems
NFPA 701	(2023; ERTA 1 2023) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

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

ANSI/SMACNA 022	(2015) Phenolic Duct Construction Standards
SMACNA 1966	(2020) HVAC Duct Construction Standards Metal and Flexible, 4th Edition
SMACNA 1981	(2008) Seismic Restraint Manual Guidelines for Mechanical Systems, 3rd Edition

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2022) Adhesive and Sealant Applications

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

U.S. DEPARTMENT OF ENERGY FEDERAL ENERGY MANAGEMENT PROGRAM (FEMP)

PL-109-58	(1992; R 2005) Energy Efiicient Procument Requirements

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 82	Protection of Stratospheric Ozone

UNDERWRITERS LABORATORIES (UL)

UL 6	(2007; Reprint Sep 2019) UL Standard for Safety Electrical Rigid Metal Conduit-Steel
UL 181	(2013; Reprint Dec 2021) UL Standard for Safety Factory-Made Air Ducts and Air Connectors
UL 705	(2017; Reprint Aug 2021) UL Standard for Safety Power Ventilators
UL 723	(2020) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL Bld Mat Dir	(updated continuously online) Building

	Materials Directory
UL Electrical Construction	(2012) Electrical Construction Equipment Directory

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 1/8-inch 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
Air handling unit Number	AHU - _____
Exhaust Fan Number	EF - _____
VAV Box Number	VAV - _____

Identify similar services with different temperatures or pressures. Where pressures could exceed 125 pounds per square inch, gage, 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 75 feet. All labels must be visible and legible from the primary service and operating area.

For Bare or Insulated Pipes	
for Outside Diameters of	Lettering
1/2 thru 1-3/8 inch	1/2 inch
1-1/2 thru 2-3/8 inch	3/4 inch
2-1/2 inch and larger	1-1/4 inch

1.2.3 Color Coding

Color coding of all piping systems must be in accordance with MIL-STD-101.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings;

SD-03 Product Data

Insulated Nonmetallic Flexible Duct Runouts

Duct Connectors

Duct Access Doors;

Manual Balancing Dampers;

Diffusers

Registers and Grilles

Louvers

In-Line Centrifugal Fans

Ceiling Exhaust Fans

PL-109-58 label for ceiling exhaust fan product

Variable Volume, Single Duct Terminal Units;

Test Procedures

Diagrams;

Indoor Air Quality for Duct Sealants

Exterior Ductwork

SD-06 Test Reports

Performance Tests;

SD-07 Certificates

Ozone Depleting Substances Technician Certification

SD-08 Manufacturer's Instructions

Manufacturer's Installation Instructions

Operation and Maintenance Training

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals;

Manual Balancing Dampers;

Variable Volume, Single Duct Terminal Units

SD-11 Closeout Submittals

Indoor Air Quality During Construction

1.4 QUALITY ASSURANCE

Except as otherwise specified, approval of materials and equipment is based on manufacturer's published data.

a. Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories, the label of or listing with reexamination in UL Bld Mat Dir, and UL 6 is acceptable as sufficient evidence that the items conform to Underwriters Laboratories requirements. In lieu of such label or listing, submit a written certificate from any nationally 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 ASTM International (ASTM), the ASME International (ASME), or other standards, 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.

d. Where products are specified to meet or exceed the specified energy efficiency requirement of FEMP-designated or ENERGY STAR covered product categories, equipment selected must have as a minimum the efficiency rating identified under "Energy-Efficient Products" at http://femp.energy.gov/procurement.

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 ASTM A123/A123M for exterior locations and cadmium-plated in conformance with ASTM B766 for interior locations.

1.4.2 Asbestos Prohibition

Do not use asbestos and asbestos-containing products.

1.4.3 Ozone Depleting Substances Technician Certification

All technicians working on equipment that contain ozone depleting refrigerants must be certified as a Section 608 Technician to meet requirements in 40 CFR 82, Subpart F. Provide copies of technician certifications to the Contracting Officer at least 14 calendar days prior to work on any equipment containing these refrigerants.

1.4.4 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.

1.4.5 Test Procedures

Conduct performance tests as required in Section 23 05 93.00 22 Testing, Adjusting and Balancing for HVAC and Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

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

Except for the fabricated duct, plenums and casings specified in paragraphs "Metal Ductwork" and "Plenums and Casings for Field-Fabricated Units",
provide components and equipment that are standard products of manufacturers regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. This requirement applies to all equipment, including diffusers, registers, fire dampers, and balancing dampers.

a. Standard products are defined as components and equipment that have been in satisfactory commercial or industrial use in similar applications of similar size for at least two years before bid opening.

b. Prior to this two year period, these standard products must have been sold on the commercial market using advertisements in manufacturers' catalogs or brochures. These manufacturers' catalogs, or brochures must have been copyrighted documents or have been identified with a manufacturer's document number.

c. Provide equipment items that are supported by a service organization. In product categories covered by ENERGY STAR or the Federal Energy Management Program, provide equipment that is listed on the ENERGY STAR Qualified Products List or that meets or exceeds the FEMP-designated Efficiency Requirements.

2.2 IDENTIFICATION PLATES

In addition to standard manufacturer's identification 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 that are 1-1/2-inches high and smaller must be 1/16-inch thick, with engraved lettering 1/8-inch high; identification plates larger than 1-1/2-inches high must be 1/8-inch thick, with engraved lettering of suitable height. Identification plates 1-1/2-inches 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 NEMA MG 11. Provide premium efficiency type integral size motors in accordance with NEMA MG 1.

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 NEMA MG 1. Select premium efficiency polyphase motors in accordance with NEMA MG 10.

d. Provide motors in accordance with NEMA MG 1 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.

e. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controllers are allowed to accomplish the same function. Use solid-state variable-speed controllers for motors rated 10 hp or less and adjustable frequency drives for larger motors.

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 SMACNA 1981

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. Paint in

accordance with Section 09 90 00 PAINTS AND COATINGS.

2.8 INDOOR AIR QUALITY

Provide equipment and components that comply with the requirements of ASHRAE 62.1 unless more stringent requirements are specified herein.

2.9 DUCT SYSTEMS

2.9.1 Metal Ductwork

Provide metal ductwork construction, including all fittings and components, that complies with SMACNA 1966, as supplemented and modified by this specification .

a. Construct ductwork meeting the requirements for the duct system static pressure specified in APPENDIX D of Section 23 05 93.00 22 TESTING, ADJUSTING AND BALANCING FOR HVAC.

b. Provide radius type elbows with a centerline radius of 1.5 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes are allowed.

c. Provide ductwork that meets the requirements of Seal Class A. Provide ductwork in VAV systems upstream of the VAV boxes that meets the requirements of Seal Class A.

d. Provide sealants that conform to fire hazard classification specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS and are suitable for the range of air distribution and ambient temperatures to which it is exposed. Do not use pressure sensitive tape as a sealant. Provide duct sealant products 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 (HVAC duct sealants are classified as "Other" within the SCAQMD Rule 1168 sealants table). Provide validation of indoor air quality for duct sealants.

e. Make spiral lock seam duct with duct sealant and lock with not less than 3 equally spaced drive screws or other approved methods indicated in SMACNA 1966. Apply the sealant to the exposed male part of the fitting collar so that the sealer is on the inside of the joint and fully protected by the metal of the duct fitting. Apply one brush coat of the sealant over the outside of the joint to at least 2 inch band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar are not acceptable.

f. Fabricate outdoor air intake ducts and plenums with watertight soldered or brazed joints and seams.

2.9.1.1 Insulated Nonmetallic Flexible Duct Runouts

Use flexible duct runouts only where indicated. Runout length is indicated on the drawings, and is not to exceed 5 feet. Provide runouts that are preinsulated, factory fabricated, and that comply with NFPA 90A and UL 181. Provide either field or factory applied vapor barrier. Provide not less than 20 ounce glass fabric duct connectors coated on both sides with neoprene. Where coil induction or high velocity units are

supplied with vertical air inlets, use a streamlined, vaned and mitered elbow transition piece for connection to the flexible duct or hose. Provide a die-stamped elbow and not a flexible connector as the last elbow to these units other than the vertical air inlet type. Insulated flexible connectors are allowed as runouts. Provide insulated material and vapor barrier that conform to the requirements of Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Do not expose the insulation material surface to the air stream.

2.9.1.2 General Service Duct Connectors

Provide a flexible duct connector approximately 6 inches 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. Provide a composite connector system that complies with NFPA 701 and is classified as "flame-retardent fabrics" in UL Bld Mat Dir.

2.9.2 Exterior Ductwork

All duct located exterior to the building shall be factory fabricated pre-insulated weatherproof outdoor duct systems designed specifically for exterior applications. The exterior surface of the duct shall be paintable. The duct shall be installed by personnel specifically trained in the fabrication and installation of the ductwork system. The factory provided ductwork system shall start at the conditioning unit connection points and continue through the exterior wall or roof, as shown on the plans. Provide complete submittal data including isometric views of the entire duct assembly with reinforcment/support spacing and seam/joint construction. Ductwork shall meet ANSI/SMACNA 022, ASTM E84 25/50, UL 181, UL 723 25/50, NFPA 90A and NFPA 90B. The ductwork shall have the following characteristics:

a. Minimum R-12 insulation value.

b. Single or multiple layer construction, nominal 2" thick walls.

c. Pressure rating: +/- 7" w.g. SMACNA Leakage Class 1.

d. Aluminum foil interior lining.

e. White color, paintable to match predominant building exterior color.

f. UV stable, multi-ply, puncture/tear resistant flexible outer covering.

g. 10 year warranty

2.9.3 Duct Access Doors

Provide hinged access doors conforming to SMACNA 1966 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 15 by 18 inches, unless otherwise shown. Where duct size does not accommodate this size door, make the doors as large as practicable. Equip doors 24 by 24 inches or larger with

fasteners operable from inside and outside the duct. Use insulated type doors in insulated ducts.

2.9.4 Manual Balancing Dampers

a. 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.

b. Unless otherwise indicated, provide opposed blade type multileaf dampers with maximum blade width of 12 inches. Provide access doors or panels for all concealed damper operators and locking setscrews. Provide access doors or panels in hard ceilings, partitions and walls for access to all concealed damper operators and damper locking setscrews. Coordinate location of doors or panels with other affected contractors.

c. 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.

2.9.4.1 Square or Rectangular Dampers

2.9.4.1.1 Duct Height 12 inches and Less

2.9.4.1.1.1 Frames

Width	Height	Galvanized Steel Thickness	Length
Maximum 19 inches	Maximum 12 inches	Minimum 20 gauge	Minimum 3 inches
More than 19 inches	Maximum 12 inches	Minimum 20 gauge	Minimum 3 inches

2.9.4.1.1.2 Single Leaf Blades

Width	Height	Galvanized Steel Thickness	Length
Maximum 19 inches	Maximum 12 inches	Minimum 20 gauge	Minimum 3 inches
More than 19 inches	Maximum 12 inches	Minimum 20 gauge	Minimum 3 inches

2.9.4.1.1.3 Blade Axles

To support the blades of round dampers, provide galvanized steel shafts supporting the blade the entire duct diameter frame-to-frame. Provide axle shafts that extend through standoff bracket and hand quadrant.

Width	Height	Material	Square Shaft
Maximum 19 inches	Maximum 12 inches	Galvanized Steel	Minimum 3/8 inch
More than 19 inches	Maximum 12 inches	Galvanized Steel	Minimum 1/2 inch

2.9.4.1.1.4 Axle Bearings

Support the shaft on each end at the frames with shaft bearings. Press fit shaft bearings configuration to provide a tight joint between blade shaft and damper frame.

Width	Height	Material
Maximum 19 inches	Maximum 12 inches	solid nylon, or equivalent solid plastic, or oil-impregnated bronze
More than 19 inches	Maximum 12 inches	oil-impregnated bronze

2.9.4.1.1.5 Control Shaft/Hand Quadrant

Provide dampers with accessible locking-type control shaft/hand quadrant operators.

Provide stand-off mounting brackets, bases, or adapters for the locking-type quadrant operators on dampers installed on ducts to be thermally insulated. Provide a minimum stand-off distance of 2 inches off the metal duct surface. Provide stand-off mounting items that are integral with the operator or standard accessory of the damper manufacturer.

2.9.4.1.1.6 Finish

Mill Galvanized

2.9.4.1.2 Duct Height Greater than 12 inches

2.9.4.1.2.1 Dampers

Provide dampers with multi-leaf opposed-type blades.

2.9.4.1.2.2 Frames

Maximum 48 inches in height; maximum 48 inches in width; minimum of 16 gauge galvanized steel,
minimum of 5 inches long.

2.9.4.1.2.3 Blades

Minimum of 20 gauge galvanized steel; 6 inch nominal width.

2.9.4.1.2.4 Blade Axles

To support the blades of round dampers, provide galvanized square steel shafts supporting the blade the entire duct diameter frame-to-frame. Provide axle shafts that extend through standoff bracket and hand quadrant.

2.9.4.1.2.5 Axle Bearings

Support the shaft on each end at the frames with shaft bearings constructed of oil-impregnated bronze, or solid nylon, or a solid plastic equivalent to nylon. Press fit shaft bearings configuration to provide a tight joint between blade shaft and damper frame.

2.9.4.1.2.6 Blade Actuator

Minimum 1/2 inch diameter galvanized steel.

2.9.4.1.2.7 Blade Actuator Linkage

Mill Galvanized steel bar and crank plate with stainless steel pivots.

2.9.4.1.2.8 Control Shaft/Hand Quadrant

Provide dampers with accessible locking-type control shaft/hand quadrant operators.

Provide stand-off mounting brackets, bases, or adapters for the locking-type quadrant operators on dampers installed on ducts to be thermally insulated. Provide a minimum stand-off distance of 2 inches off the metal duct surface. Provide stand-off mounting items that are integral with the operator or standard accessory of the damper manufacturer.

2.9.4.1.2.9 Finish

Mill Galvanized

2.9.4.2 Round Dampers

2.9.4.2.1 Frames

Size	Galvanized Steel Thickness	Length
4 to 20 inches	Minimum 20 gauge	Minimum 6 inches
22 to 30 inches	Minimum 20 gauge	Minimum 6 inches
32 to 40 inches	Minimum 20 gauge	Minimum 6 inches

2.9.4.2.2 Blades

Size	Galvanized Steel Thickness
4 to 20 inches	Minimum 20 gauge
22 to 30 inches	Minimum 20 gauge
32 to 40 inches	Minimum 16 gauge

2.9.4.2.3 Blade Axles

To support the blades of round dampers, provide galvanized steel shafts supporting the blade the entire duct diameter frame-to-frame. Provide axle shafts that extend through standoff bracket and hand quadrant.

Size	Shaft Size and Shape
4 to 20 inches	Minimum 3/8 inch square
22 to 30 inches	Minimum 1/2 inch square
32 to 40 inches	Minimum 3/4 inch square

2.9.4.2.4 Axle Bearings

Support the shaft on each end at the frames with shaft bearings constructed of oil-impregnated bronze, nylon, or a solid plastic equivalent to nylon. Axle bearings intended for low leakage at the damper frame must be neoprene, nitrile, or equivalent of 60 or greater durometer to reduce damper blade vibration. Press fit shaft bearings configuration to provide a tight joint between blade shaft and damper frame.

Size	Material
4 to 20 inches	solid nylon, or equivalent solid plastic, or oil-impregnated bronze
22 to 30 inches	solid nylon, or equivalent solid plastic, or oil-impregnated bronze
32 to 40 inches	oil-impregnated bronze, or stainless steel sleeve bearing

2.9.4.2.5 Control Shaft/Hand Quadrant

Provide dampers with accessible locking-type control shaft/hand quadrant operators.

Provide stand-off mounting brackets, bases, or adapters for the locking-type quadrant operators on dampers installed on ducts to be

thermally insulated. Provide a minimum stand-off distance of 2 inches off the metal duct surface. Provide stand-off mounting items that are integral with the operator or standard accessory of the damper manufacturer.

2.9.4.2.6 Finish

Mill Galvanized

2.9.5 Automatic Balancing Dampers

Provide dampers as specified in paragraph SUPPLEMENTAL COMPONENTS/SERVICES, subparagraph CONTROLS.

2.9.6 Diffusers, Registers, and Grilles

Provide factory-fabricated units of aluminum that distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm 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 ASHRAE 70. Provide sound rated and certified inlets and outlets according to ASHRAE 70. 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 7 feet above the floor, protect them by a grille or screen according to NFPA 90A.

2.9.6.1 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.

2.9.6.2 Perforated Plate Diffusers

Provide adjustable one-way, two-way, three-way, or four-way air pattern controls as indicated. Provide diffuser faceplates that do not sag or deflect when operating under design conditions.

2.9.6.3 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 6 inches below the ceiling unless otherwise indicated. Locate return and exhaust registers 6 inches 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.

2.9.6.4 Registers

Double-deflection supply registers. Provide manufacturer-furnished volume dampers. Provide volume dampers of the group-operated, opposed-blade type and key adjustable by inserting key through face of register. Operating mechanism must not project through any part of the register face. Automatic volume control devices are acceptable. Provide exhaust and return registers as specified for supply registers, except provide exhaust and return registers that have a single set of nondirectional face bars or vanes having the same appearance as the supply registers.

2.9.7 Louvers

Provide louvers for installation in exterior walls that are associated with the air supply and distribution system.

2.9.8 Bird Screens and Frames

Provide bird screens that conform to ASTM E2016, No. 2 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.

2.10 AIR SYSTEMS EQUIPMENT

2.10.1 Fans

Test and rate fans according to AMCA 210. Calculate system effect on air moving devices in accordance with AMCA 201 where installed ductwork differs from that indicated on drawings. 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 AMCA 300 and rated in accordance with AMCA 301. Provide all fans with an AMCA seal. Connect fans to the motors either directly or indirectly with V-belt drive. Use V-belt drives designed for not less than 140 percent of the connected driving capacity. Provide variable pitch motor sheaves for 15 hp and below, and fixed pitch as defined by AHRI Guideline D (A fixed-pitch sheave is provided on both the fan shaft and the motor shaft. This is a non-adjustable speed drive.). Select variable pitch sheaves to drive the fan at a speed which can produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, provide a replaceable sheave when needed to achieve system air balance. Provide motors for V-belt drives with adjustable rails or bases. Provide removable metal guards for all exposed V-belt drives, and provide speed-test openings at the center of all rotating shafts. Provide fans with personnel screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. 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 AMCA 300. Provide standard AMCA arrangement, rotation, and discharge as indicated. Provide power ventilators that conform to UL 705 and have a UL label.

2.10.1.1 In-Line Centrifugal Fans

Provide in-line fans with centrifugal backward inclined blades, stationary discharge conversion vanes, internal and external belt guards, and adjustable motor mounts. Mount fans in a welded tubular casing. Provide a fan that axially flows the air in and out. Streamline inlets with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Enclose and isolate fan bearings and drive shafts from the air stream. Provide precision, self aligning ball or roller type fan bearings that are sealed against dust and dirt and are permanently lubricated. Provide L50 rated bearing life at not less than 200,000 hours as defined by ABMA 9 and ABMA 11. Provide motors with opendripproof enclosure.

2.10.1.2 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. Provide U.L. listed fans. Provide PL-109-58 labeled ceiling exhaust fan product. Provide proof of PL-109-58 label for ceiling exhaust fan product.

2.11 TERMINAL UNITS

2.11.1 Variable Air Volume (VAV) Terminal Units

a. Provide VAV terminal units that are the type, size, and capacity shown, mounted in the ceiling or wall cavity, plus units that are suitable for single or dual duct system applications. Provide actuators and controls as specified in paragraph SUPPLEMENTAL COMPONENTS/SERVICES, subparagraph CONTROLS. For each VAV terminal unit, provide a temperature sensor in the unit discharge ductwork.

b. Provide unit enclosures that are constructed of galvanized steel not lighter than 22 gauge or aluminum sheet not lighter than 18 gauge. Provide single or multiple discharge outlets as required. Units with flow limiters are not acceptable. Provide unit air volume that is factory preset and readily field adjustable without special tools. Provide reheat coils as indicated.

c. Attach a flow chart to each unit. Base acoustic performance of the terminal units upon units tested according to AHRI 880 I-P with the calculations prepared in accordance with AHRI 885. Provide sound power level as indicated. Show discharge sound power for minimum and 1-1/2 inches water gauge inlet static pressure. Provide acoustical lining according to NFPA 90A.

2.11.1.1 Variable Volume, Single Duct Terminal Units

Provide variable volume, single duct, terminal units with a calibrated air volume sensing device, air valve or damper, actuator, and accessory

relays. Provide units that control air volume to within plus or minus 5 percent of each air set point volume as determined by the thermostat with variations in inlet pressures from 3/4 to 6 inch water gauge. Provide units with an internal resistance not exceeding 0.4 inch water gauge at maximum flow range. Provide external differential pressure taps separate from the control pressure taps for air flow measurement with a 0 to 1 inch water gauge range.

2.11.1.1.1 Coils

Fabricate coils from not less than 3/8 inch outside diameter seamless copper tubing, with copper or aluminum fins mechanically bonded or soldered to the tubes. Provide coils with not less than 1/2 inch outside diameter flare or sweat connectors, accessory piping package with thermal connections suitable for connection to the type of control valve supplied, and manual air vent. Test coils hydrostatically at 300 psi or under water at 250 psi air pressure. Provide coils suitable for 200 psi working pressure. Make provisions for coil removal.

2.11.1.1.2 Drain Pans

Size and locate drain and drip pans to collect all water condensed on and dripping from any item within the unit enclosure or casing. Provide condensate drain pans designed for self-drainage to preclude the buildup of microbial slime and thermally insulated to prevent condensation and constructed of not lighter than 21 gauge type 304 stainless steel or noncorrosive ABS plastic. Provide insulation with a flame spread rating not over 25 without evidence of continued progressive combustion, a smoke developed rating no higher than 50, and of a waterproof type or coated with a waterproofing material. Design drain pans so as to allow no standing water and pitch to drain. Provide minimum 3/4 inch NPT or 5/8 inch OD drain connection in drain pan. Provide plastic or metal auxiliary drain pans to catch drips from control and piping packages, eliminating insulation of the packages; if metal, provide auxiliary pans that comply with the requirements specified above. Extend insulation at control and piping connections 1 inch minimum over the auxiliary drain pan.

2.12 FACTORY PAINTING

Factory paint new equipment, which are not of galvanized construction. Paint with a corrosion resisting paint finish according to ASTM A123/A123M or ASTM A924/A924M. Clean, phosphatize and coat internal and external ferrous metal surfaces with a paint finish which has been tested according to ASTM B117, ASTM D1654, and ASTM D3359. 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 1/8 inch. 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 ASTM D520 Type I.

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.

2.13 SUPPLEMENTAL COMPONENTS/SERVICES

2.13.1 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 except as modified herein.

2.13.2 Insulation

The requirements for shop and field applied insulation are specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.13.3 Controls

The requirements for controls are specified in 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL 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 3 feet. In front of all access doors to electrical circuits, clear the area the minimum distance to energized circuits as specified in OSHA Standards, part 1910.333 (Electrical-Safety Related work practices)and an additional 3 feet.

c. 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 2 inches plus the number of inches, measured in water gauge, 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 6 inch 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.

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 SMACNA 1966 unless otherwise indicated. Install duct supports for sheet metal ductwork according to SMACNA 1966, unless otherwise specified. Do not use friction beam clamps indicated in SMACNA 1966. 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 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, perform temporary dust control protection. Protect the distribution system (supply and return) with temporary seal-offs at all inlets and outlets at the end of each day's work. Keep temporary protection in place until system is ready for startup.

3.2.7 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 .

3.2.8 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.

3.2.9 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 3-inch margin around the equipment and supports. Allow equipment bases and foundations, when constructed of concrete or grout, to cure a minimum of 14 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. When the work area is in an occupied space such as office, laboratory or warehouse protect all furniture and equipment from dirt and debris. Incorporate housekeeping for field construction work which leaves all furniture and equipment in the affected area free of construction generated dust and debris; and, all floor surfaces vacuum-swept clean.

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 15 inches and smaller. Build framed, prepared openings for round duct larger than 15 inches and square, rectangular or oval ducts. Sleeves and framed openings are also required where grilles, registers,

and diffusers are installed at the openings. Provide one inch 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 ASTM C553, Type 1, Class B-2.

3.6.1 Sleeves

Fabricate sleeves, except as otherwise specified or indicated, from 20 gauge thick mill galvanized sheet metal. Where sleeves are installed in bearing walls or partitions, provide black steel pipe conforming with ASTM A53/A53M, Schedule 20.

3.6.2 Framed Prepared Openings

Fabricate framed prepared openings from 20 gauge 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 60 degrees F, 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 4 inches 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 15 inches in diameter or less from 20 gauge galvanized steel. Fabricate collars for square and rectangular ducts, or round ducts with minimum dimension over 15 inches from 18 gauge galvanized steel. Fabricate collars for square and rectangular ducts with a maximum side of 15 inches or less from 20 gauge galvanized steel. Install collars with fasteners a maximum of 6 inches on center. Attach to collars a minimum of 4 fasteners where the opening is 12 inches in diameter or less, and a minimum of 8 fasteners where the opening is 20 inches in diameter or less.

3.7 FIELD PAINTING OF MECHANICAL EQUIPMENT

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 clean to bare metal on metal surfaces subject to temperatures in excess of 120 degrees F. 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. Provide aluminum or light gray finish coat.

3.7.1 Temperatures less than 120 degrees F

Immediately after cleaning, apply one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied

to a minimum dry film thickness of one mil per coat to metal surfaces subject to temperatures less than 120 degrees F.

3.8 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 1-3/8 inch minimum diameter with stamped or engraved markings. Make indentations black for reading clarity. Attach tags to valves with No. 12 AWG 0.0808-inch diameter corrosion-resistant steel wire, copper wire, chrome-plated beaded chain or plastic straps designed for that purpose.

3.9 DUCTWORK LEAK TESTS

The requirements for ductwork leak tests are specified in Section 23 05 93.00 22 TESTING, ADJUSTING AND BALANCING FOR HVAC.

3.10 TESTING, ADJUSTING, AND BALANCING

The requirements for testing, adjusting, and balancing are specified in Section 23 05 93.00 22 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

Conduct performance tests as required in Section 23 05 93.00 22 Testing, Adjusting and Balancing for HVAC and Section 23 09 23.02 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

3.12 CLEANING AND ADJUSTING

Inside of air handling units and air terminal units thoroughly clean ducts, plenums, and casing of debris and blow free of small particles of rubbish and dust and then vacuum clean before installing outlet faces. 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 Section 01 78 23 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 8 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 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this section with the additions and modifications specified herein.

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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 500-L	(2015) Laboratory Methods of Testing Louvers for Rating

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI 700	(2016) Specifications for Fluorocarbon Refrigerants
ANSI/AHRI 210/240	(2008; Add 1 2011; Add 2 2012) Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment
ANSI/AHRI 460	(2005) Performance Rating of Remote Mechanical-Draft Air-Cooled Refrigerant Condensers
ANSI/AHRI 495	(2005) Performance Rating of Refrigerant Liquid Receivers

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

ANSI/ASHRAE 15 & 34	(2016) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
ASHRAE 15 & 34	(2013) ASHRAE Standard 34-2016 Safety Standard for Refrigeration Systems/ASHRAE Standard 34-2016 Designation and Safety Classification of Refrigerants-ASHRAE Standard 34-2016
ASHRAE 52.2	(2017) Method of Testing General Ventilation Air-Cleaning Devices for

	Removal Efficiency by Particle Size
ASHRAE 55	(2010) Thermal Environmental Conditions for Human Occupancy
ASHRAE 62.1	(2016) Ventilation for Acceptable Indoor Air Quality
ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications
ASME BPVC SEC VIII D1	(2019) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

AMERICAN WELDING SOCIETY (AWS)

AWS Z49.1	(2021) Safety in Welding and Cutting and Allied Processes

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C1071	(2019) Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
ASTM D520	(2000; R 2011) Zinc Dust Pigment
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2021) Motors and Generators
NEMA MG 2	(2014) Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-5541	(2006; Rev F) Chemical Conversion Coatings on Aluminum and Aluminum Alloys

UL SOLUTIONS (UL)

UL 207	(2009; Reprint Jan 2020) Refrigerant-Containing Components and Accessories, Nonelectrical
UL 586	(2009; Reprint Sep 2022) UL Standard for Safety High-Efficiency Particulate, Air Filter Units
UL 900	(2015) Standard for Air Filter Units
UL 1995	(2015) UL Standard for Safety Heating and Cooling Equipment

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Coil Corrosion Protection

Supplied Products

Manufacturer's Standard Catalog Data

SD-06 Test Reports

Refrigerant Tests, Charging, and Start-Up;

System Performance Tests;

SD-07 Certificates

Service Organizations

1.4 QUALITY ASSURANCE

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. Submit drawings consisting of:

a. Equipment layouts which identify assembly and installation details.

b. Plans and elevations which identify clearances required for maintenance and operation.

c. Wiring diagrams which identify each component individually and interconnected or interlocked relationships between components.

d. Foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for equipment indicated or required to have concrete foundations.

e. Details, if piping and equipment are to be supported other than as indicated, which include loadings and type of frames, brackets, stanchions, or other supports.

f. Automatic temperature control diagrams and control sequences.

g. Installation details which includes the amount of factory set superheat and corresponding refrigerant pressure/temperature.

h. Equipment schedules

1.5 DELIVERY, STORAGE, AND HANDLING

Protect stored items from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Properly protect and care for all material both before and during installation. Replace any materials found to be damaged, at no additional cost to the Government. During installation, cap piping and similar openings capped to keep out dirt and other foreign matter.

1.6 ENVIRONMENTAL REQUIREMENTS

For proper Indoor Environmental Quality, maintain pressure within the building as indicated. Ventilation must meet or exceed ASHRAE 62.1 and all published addenda. Meet or exceed filter media efficiency as tested in accordance with ASHRAE 52.2. Thermal comfort must meet or exceed ASHRAE 55 .

1.7 WARRANTY

Provide equipment with the Manufacturer's Standard Warranty.

PART 2 PRODUCTS

2.1 ENERGY EFFICIENCY REQUIREMENTS

42 USC 8259b requires the procurement of energy efficient products in product categories covered by the Energy Star program or the Federal Energy Management Program for designated products. A list of covered product categories is available from the Federal Energy Management Web site at http://energy.gov/eere/femp/covered-product-categories.

Submit Material, Equipment, and Fixtures List of all supplied products within a covered product category, including manufacturer's catalog numbers, specification and drawing reference number, warranty information, fabrication site, and energy performance data. For product categories covered by the Federal Energy Management Program, submit documentation that the product meets or exceeds FEMP-designated efficiency requirements.

2.2 MATERIALS

Provide 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. Data includes manufacturer's recommended installation instructions and procedures. If vibration isolation is specified for a unit, include vibration isolator literature containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations. Submit data for each specified component. Minimum efficiency requirements must be in accordance with ASHRAE 90.1 - IP.

2.2.1 Standard Products

Provide materials and equipment that are standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products must have been in satisfactory commercial or industrial use for 2 years prior to request for proposal. The 2 year use includes applications of equipment and materials under similar circumstances and of similar size. The 2 years' experience must 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. Products must be supported by a service organization. Ensure system components are environmentally suitable for the indicated geographic locations.

2.2.2 Product Sustainability Criteria

2.2.2.1 Energy Efficient Equipment

Provide equipment meeting the efficiency requirements as stated within this section and provide documentation in conformance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph ENERGY EFFICIENT EQUIPMENT.

2.2.2.2 Electrical Equipment / Motors

Provide electrical equipment, motors, motor efficiencies, and wiring which are in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Electrical motor driven equipment specified must be provided complete with motors, motor starters, and controls. Electrical characteristics must be as shown, and unless otherwise indicated, all motors of 1 horsepower and above with open, dripproof, totally enclosed, or explosion proof fan cooled enclosures, must be the premium efficiency type in accordance with NEMA MG 1. Field wiring must be in accordance with manufacturer's instructions. Each motor must conform to NEMA MG 1 and NEMA MG 2 and be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Motors must be continuous duty with the enclosure specified. Motor starters must be provided complete with thermal overload protection and other appurtenances necessary for the motor control indicated. Motors must be furnished with a magnetic across-the-line or reduced voltage type starter as required by the manufacturer. Motor duty requirements must allow for maximum frequency start-stop operation and minimum encountered interval between

start and stop. Motors must be sized for the applicable loads. Motor torque must be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings must be fitted with grease supply fittings and grease relief to outside of enclosure. 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, must be provided.

2.2.3 Nameplates

Major equipment including compressors, condensers, receivers, heat exchanges, 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 and made of stainless steel . Fix plates in prominent locations with nonferrous screws or bolts.

2.2.4 Safety Devices

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel must be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices must be installed so that proper operation of equipment is not impaired. Welding and cutting safety requirements must be in accordance with AWS Z49.1.

2.3 EQUIPMENT

2.3.1 Self-Contained Air Conditioners Heat Pumps2.3.1.1 Large-Capacity Self-Contained air conditioners Heat Pumps (Greater than 65,000 Btu/h)

2.3.1.1.1 General

Provide an air-cooled, factory assembled, weatherproof packaged unit for dedicated downflow airflow. Exterior panels must be zinc coated galvanized steel phosphatized and painted. All access doors and panels must be hinged with neoprene gaskets. Unit must be listed, labeled, and classified in accordance with UL 1995. Unit must be rated in accordance with ANSI/AHRI 210/240. Provide unit with equipment as specified in paragraph UNITARY EQUIPMENT COMPONENTS. Evaporator or supply fans must be direct drive forward curved centrifugal scroll type. Condenser fans must be manufacturer's standard for the unit specified and may be either propeller or centrifugal scroll type. UProvide unit with a full factory operating charge of refrigerant. Unit must be 100 percent run tested at the factory. No penetrations are allowed within the perimeter of the curb in the down flow unit's base pan other than the raised 1-1/8 inch high supply/return openings to provide added water integrity precaution from condensate drain back up.

Provide a belt driven, forward curved centrifugal indoor fan with adjustable motor sheaves. Thermally protect all motors. Provide unit with a removable, reversible, double-sloped condensate drain pan. Air conditioners must have a minimum seasonal energy efficiency ratio (EER) of 14, and a minimum COP of 3.3. Provide unit with hot gas reheat.

2.3.1.1.2 Casing

Construct exterior casings for the specified unitary equipment of factory

phosphatized and painted galvanized steel or aluminum sheet metal and galvanized or aluminum structural members. Fit casing with lifting provisions, access panels or doors, fan vibration isolators, electrical control panel, corrosion-resistant components, structural support members, insulated condensate drip pan and drain, and internal insulation in the cold section of the casing. All access doors and panels must have neoprene gaskets. Casing must have double-wall, hinged access doors for filters, heating, return/exhaust air, and supply fan section. Incorporate provisions to permit replacement of major unit components. Seal penetrations of cabinet surfaces, including the floor. Unit base must be watertight. Fit unit with a drain pan which extends under all areas where water may accumulate. Fabricate drain pan from Type 30X stainless steel, galvanized steel with protective coating, or an approved plastic material. Pan insulation must be water impervious. Extent and effectiveness of the insulation of unit air containment surfaces must prevent, within limits of the specified insulation, heat transfer between the unit exterior and ambient air, heat transfer between the two conditioned air streams, and condensation on surfaces. Insulation must conform to ASTM C1071.

2.3.1.1.3 Air-to-Refrigerant Coils

Provide air-to-refrigerant coils with seamless copper or aluminum tubes of 5/16 inch minimum diameter with copper or aluminum fins that are mechanically bonded or soldered to the tubes. Casing must be galvanized steel or aluminum. Avoid contact of dissimilar metals. Test coils in accordance with ANSI/ASHRAE 15 & 34 at the factory and must be suitable for the working pressure of the installed system. Factory pressure and leak test each coil.

a. Provide separate expansion devices for each compressor circuit. Condensate drain pans must be removable and double-sloped.

b. Dual compressor units must have intermingled evaporator coils.

c. Condensate drain pans must be removable and double-sloped.

d. Provide condenser coils with hail protection guards.

e. Coat condenser evaporator condenser and evaporator coil with a uniformly applied epoxy electrodeposition, phenolic, or vinyl type coating to all coil surface areas without material bridging between fins. Apply coating at either the coil or coating manufacturer's factory. Coating process must ensure complete coil encapsulation. Coating must be capable of withstanding a minimum 6000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution.

2.3.1.1.4 Compressor

Provide direct drive, hermetic reciprocating, or scroll type compressor. Compressor must have internal over current and over temperature protection, internal pressure relief, high pressure cutout, rotor lock suction and discharge refrigerant connections, centrifugal oil pump, vibration isolation, and discharge refrigerant connections. Compressors must have crankcase heaters. Motor must be suction gas-cooled. Cooling partial load capacity must be provided by a dual stage compressor .

2.3.1.1.5 Refrigeration Circuit

Refrigerant containing components must comply with ANSI/ASHRAE 15 & 34 and be factory tested, cleaned, dehydrated, charged, and sealed. Provide refrigerant lines with service pressure tap ports and refrigerant line filter.

2.3.1.1.6 Unit Controls

Provide units internally prewired by manufacturer with a 24 volt electromechanical control circuit powered by an internal transformer. Provide terminal blocks for power wiring and external control wiring. Internally protect unit by fuses or a circuit breaker in accordance with UL 1995. Units with three-phase power must be equipped with phase monitoring protection to protect against problems caused by phase loss, phase imbalance and phase reversal.

a. Provide unit with microprocessor controls to provide all 24V control functions. Control unit by a two stage heating /cooling thermostat with automatic changeover.

2.3.1.1.7 Ventilation Damper Assembly

Operated by automatic actuator. Dampers must close on unit shutdown or loss of power and open on heating or cooling start-up. Dampers must have a maximum leakage rate of 3 CFM/ft2 at 1 inch w.g. static pressure.

2.3.1.1.8 Supply Air Fan

Units having AHRI cooling capacity equal or greater than 110,000 Btu/h must have supply fans controlled by two-speed motors .

Provide direct drive, forward curved, centrifugal scroll type supply air fan.

2.3.1.1.9 Roof Curb

Provide a roof curb that mates with the unit to provide support and be completely weather tight. Provide curb with sealing strips to ensure an airtight seal between supply and return openings of the curb and unit. Design curb to allow ductwork to be directly connected to the curb. The roof curb must be provided by the Manufacturer of the equipment.

2.3.1.1.10 Primary/Supplemental Heat

Provide heating unit with internal thermal insulation having a fire hazard rating not to exceed 25 for flame spread and 50 for smoke developed as determined by ASTM E84.

2.3.1.1.10.1 Electric Heating

Provide electric duct heater in accordance with UL 1995 and NFPA 70. Coil must be completely assembled, unit-mounted, and integral to the unit. Provide coil with nickel chromium elements and a maximum density of 40 watts per square inch. Provide coil with automatic reset high limit control operating through heater backup contactors. Provide coil casing and support brackets of galvanized steel or aluminum. Mount coil to eliminate noise from expansion and contraction and be completely accessible for service.

2.3.1.1.11 Single Source Power Entry

Provide single source power entry to allow single source power connection to unit and heater combination. Single source power entry kit includes specific matching heater(s), high voltage terminal blocks, fuse blocks and fuses, cut-to-length interconnecting wiring, and plug with matching receptaclejunction box (if required) to provide power sources with fuse protection as required for both the unit and accessory heater. The equipment disconnect must be provided by the Manufacturer of the equipment.

2.3.1.1.12 Manual Outside Air Damper

Provide manual outside air damper with rain hood and screen suitable for up to 25 percent outside air. Test Louvers in accordance with AMCA 500-L.

2.3.1.1.13 Low Ambient Control

Provide low ambient control to allow cycling of compressor for cooling operation at low ambient temperatures down to 0 degrees F.

2.3.1.1.14 Filters

Provide 2 inch thick high efficiency throwaway type filters that are MERV 13. Filters must have an average dust spot efficiency of 25-35 percent and an average arrestance of 90 percent when tested in accordance with ASHRAE 52.2. Filters must be UL Class 1.

2.3.2 Split-System Air Conditioners Heat Pumps

2.3.2.1 Small-Capacity Split-System Air-Conditioners (Not Exceeding 65,000 Btu/hr)

Provide an air-cooled, split system which employs a remote condensing unit, a separate ceiling mounted indoor unit, and interconnecting refrigerant piping. Provide the heat pump type unit conforming to applicable Underwriters Laboratories (UL) standards including UL 1995. Unit must be rated in accordance with ANSI/AHRI 210/240. Provide indoor unit with necessary fans, air filters, and galvanized steel cabinet construction. The remote unit must be as specified in paragraph CONDENSING UNIT. Provide double-width, double inlet, forward curved backward inclined, or airfoil blade, centrifugal scroll type evaporator or supply fans. Provide the manufacturer's standard condenser or outdoor fans for the unit specified and may be propeller type. Fan and condenser motors must have totally enclosed enclosures. Design unit to operate at outdoor ambient temperatures up to 95 degrees F.

2.3.2.1.1 Air-to-Refrigerant Coil

Provide condensing coils with copper tubes of 3/8 inch minimum diameter with aluminum fins that are mechanically bonded or soldered to the tubes. Casing must be galvanized steel or aluminum. Avoid contact of dissimilar metals. Test coils in accordance with ASHRAE 15 & 34 at the factory and ensure suitability for the working pressure of the installed system. Dehydrate and seal each coil testing and prior to evaluation and charging.

Coat condenser and evaporator coil with a uniformly applied epoxy electrodeposition, phenolic, or vinyl type coating to all coil surface areas without material bridging between fins. Apply coating at either the

coil or coating manufacturer's factory. Coating process must ensure complete coil encapsulation and be capable of withstanding a minimum 3000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution.

2.3.2.1.2 Refrigeration Circuit

Refrigerant-containing components must comply with ASHRAE 15 & 34 and be factory tested, cleaned, dehydrated, charged, and sealed. Provide each unit with a factory operating charge of refrigerant and oil or a holding charge. Field charge unit shipped with a holding charge. Provide refrigerant charging valves. Provide filter-drier in liquid line.to prevent freeze-up in event of loss of water flow during heating cycle.

2.3.2.1.3 Unit Controls

Provide unit internally prewired with a 24 volt control circuit powered by an internal transformer. Provide terminal blocks for power wiring and external control wiring. Internally protect unit by fuses or a circuit breaker in accordance with UL 1995. Equip units with three-phase power with phase monitoring protection to protect against problems caused by phase loss, phase imbalance and phase reversal. Provide unit with microprocessor controls to provide all 24V control functions.

2.3.2.1.4 Condensing Coil

Provide coils with copper tubes of 3/8 inch minimum diameter with aluminum fins that are mechanically bonded or soldered to the tubes. Protect coil in accordance with paragraph CORROSION PROTECTION. Provide galvanized steel or aluminum casing. Avoid contact of dissimilar metals. Test coils in accordance with ANSI/ASHRAE 15 & 34 at the factory and ensure suitability for the working pressure of the installed system. Dehydrate and seal eacj coil after testing and prior to evaluation and charging. Provide separate expansion devices for each compressor circuit.

2.3.2.1.5 Remote Condenser or Condensing Unit

Fit each remote condenser coil fitted with a manual isolation valve and an access valve on the coil side. Saturated refrigerant condensing temperature must not exceed 120 degrees F at 104 degrees F ambient. Provide unit with low ambient condenser controls to ensure proper operation in an ambient temperature of 20degrees F. Provide fan and cabinet construction as specified in paragraph UNITARY EQUIPMENT ACCESSORIES. Fan and condenser motors must have totally enclosed enclosures. 2.3.2.1.5.1 Air-Cooled Condenser

Provide Unit in accordance with ANSI/AHRI 460 and conform to the requirements of UL 1995. Provide factory fabricated, tested, packaged, and self-contained unit; complete with casing, propeller type fans, heat rejection coils, connecting piping and wiring, and all necessary accessories.

2.3.2.1.6 Primary/Supplemental Heat

Provide heating unit with internal thermal insulation having a fire hazard rating not to exceed 25 for flame spread and 50 for smoke developed as determined by ASTM E84.

2.3.2.1.6.1 Electric Heating

Construct electric heater of heavy-duty nickel chromium elements. Achieve staging through the unit control processor. Each heater must have automatically reset high limit control. Heaters must be individually fused from the factory and comply with NEC requirements. Power assemblies must provide single point connection. Electric heat modules must be listed and labeled by a national recognized testing laboratory acceptable to authorities having jurisdiction. Electric heater controls must confirm the supply fan is operating before electric elements are energized. Operate electric heater in stages when outdoor ambient is too low to maintain space thermostat setting with compressor operation.

2.3.2.1.7 Air Filters

Provide filters of the panel type that are capable of filtering the entire air supply. Mount filter(s) integral within the unit and make accessible by hinged access panel(s). 2 inch MERV 13, provide throwaway filter on all units below 6 Tons.

Provide filter rack that can be converted to 2.0 inch capability. Filters must be MERV 13. Provide UL Class 1 filters.

2.3.2.1.8 Fans

Provide direct driven, statically and dynamically balanced, centrifugal type fans. Design the outdoor fan so that condensate will evaporate without drip, splash, or spray on building exterior. Provide indoor fan with a minimum two-speed motor with built-in overload protection. Fan motors must be the inherently protected, permanent split-capacitor type.

2.4 COMPONENTS

2.4.1 Refrigerant and Oil

Refrigerant must be one of the fluorocarbon gases. Refrigerants must have number designations and safety classifications in accordance with ASHRAE 15 & 34. Refrigerants must meet the requirements of AHRI 700 as a minimum. Provide a complete charge of refrigerant for the installed system as recommended by the manufacturer. Lubricating oil must be of a type and grade recommended by the manufacturer for each compressor. Where color leak indicator dye is incorporated, charge must be in accordance with manufacturer's recommendation.

2.4.2 Fans

Fan wheel shafts must be supported by either maintenance-accessible lubricated antifriction block-type bearings, or permanently lubricated ball bearings. Unit fans must be selected to produce the cfm required at the fan total pressure. Motor starters, if applicable, must be magnetic across-the-line type with a open enclosure. Thermal overload protection must be of the manual or automatic-reset type. Fan wheels or propellers must be constructed of aluminum or galvanized steel. Centrifugal fan wheel housings must be of galvanized steel, and both centrifugal and propeller fan casings must be constructed of aluminum or galvanized steel. Steel elements of fans, except fan shafts, must be hot-dipped galvanized after fabrication or fabricated of mill galvanized steel.

Mill-galvanized steel surfaces and edges damaged or cut during fabrication by forming, punching, drilling, welding, or cutting must be recoated with an approved zinc-rich compound. Fan wheels or propellers must be statically and dynamically balanced. Direct-drive fan motors must be of the multiple-speed variety.

2.4.3 Primary/Supplemental Heating

2.4.3.1 Electric Heating Coil

Coil must be an electric duct heater in accordance with UL 1995 and NFPA 70. Coil must be duct- or unit-mounted. Coil must be of the nickel chromium resistor, single stage, strip type. Coil must be provided with a built-in or surface-mounted high-limit thermostat interlocked electrically so that the coil cannot be energized unless the fan is energized. Coil casing and support brackets must be of galvanized steel or aluminum. Coil must be mounted to eliminate noise from expansion and contraction and be completely accessible for service. Supplemental Electric Resistance Heating controls must be provided to prevent operation when the heating load can be met by the primary source.

2.4.4 Air Filters

Provide filters to filter outside air and return air and locate inside air conditioners . Provide replaceable (throw-away) type. Filters must conform to UL 900, Class 1 . Polyurethane filters cannot be used on units with multiframe filters.

Air filters must be listed in accordance with requirements of UL 900, except high efficiency particulate air filters of 99.97 percent efficiency by the DOP Test Method must be as listed under the label service and must meet the requirements of UL 586.

2.4.4.1 Extended Surface Pleated Panel Filters

Filters must be 2 inch depth sectional type of the size indicated and must have an average efficiency of 25 to 30 percent when tested in accordance with ASHRAE 52.2. Initial resistance at 500 feet/minute must not exceed 0.36 inches water gauge. Filters must be UL Class 2. Media must be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media must be attached to a moisture resistant fiberboard frame. Four edges of the filter media must be bonded to the inside of the frame to prevent air bypass and increase rigidity.

2.4.5 Coil Frost Protection

Provide each circuit with a manufacturer's standard coil frost protection system. The coil frost protection system must use a temperature sensor in the suction line of the compressor to shut the compressor off when coil frosting occurs. Use timers to prevent the compressor from rapid cycling.

2.4.6 Pressure Vessels

Pressure vessels must conform to ASME BPVC SEC VIII D1 or UL 207, as applicable for maximum and minimum pressure or temperature encountered. Where referenced publications do not apply, test pressure components at 1-1/2 times design working pressure. Refrigerant wetted carbon steel surfaces must be pickled or abrasive blasted free of mill scale, cleaned, dried, charged, and sealed.

2.4.6.1 Hot Gas Muffler

Unit must be selected by the manufacturer for maximum noise attenuation. Units rated for 30 tons capacity and under may be field tunable type.

2.4.6.2 Liquid Receiver

A liquid receiver must be provided when a system's condenser or compressor does not contain a refrigerant storage capacity of at least 20 percent in excess of a fully charged system. Receiver must be designed, filled, and rated in accordance with the recommendations of ANSI/AHRI 495, except as modified herein. Receiver must be fitted to include an inlet connection; an outlet drop pipe with oil seal and oil drain where necessary; two bull's-eye liquid level sight glass in same vertical plane, 90 degrees apart and perpendicular to axis of receiver or external gauge glass with metal guard and automatic stop valves; and purge, charge, equalizing, pressurizing, plugged drain and service valves on the inlet and outlet connections. Receiver must be provided with a relief valve of capacity and setting in accordance with ASHRAE 15 & 34.

2.4.7 Cabinet Construction

Casings for the specified unitary equipment must be constructed of galvanized steel or aluminum sheet metal and galvanized or aluminum structural members. Minimum thickness of single wall exterior surfaces must be 18 gauge galvanized steel or 0.071 inch thick aluminum on units with a capacity above 20 tons and 20 gauge galvanized steel or 0.064 inch thick aluminum on units with a capacity less than 20 tons. Casing must be fitted with lifting provisions, access panels or doors, fan vibration isolators, electrical control panel, corrosion-resistant components, structural support members, insulated condensate drip pan and drain, and internal insulation in the cold section of the casing. Where double-wall insulated construction is proposed, minimum exterior galvanized sheet metal thickness must be 20 gauge. Provisions to permit replacement of major unit components must be incorporated. Penetrations of cabinet surfaces, including the floor, must be sealed. Unit must be fitted with a drain pan which extends under all areas where water may accumulate. Drain pan must be fabricated from Type 300 stainless steel, galvanized steel with protective coating as required, or an approved plastic material. Pan insulation must be water impervious. Extent and effectiveness of the insulation of unit air containment surfaces must prevent, within limits of the specified insulation, heat transfer between the unit exterior and ambient air, heat transfer between the two conditioned air streams, and condensation on surfaces. Insulation must conform to ASTM C1071. Paint and finishes must comply with the requirements specified in paragraph FACTORY COATING.

2.4.7.1 Indoor Cabinet

Indoor cabinets must be suitable for the specified indoor service and enclose all unit components.

2.4.8 Refrigerant Piping

Provide refrigerant piping in accordance with Section 23 23 00 REFRIGERANT PIPING.

2.4.9 Condensate Drain Piping

provide condensate drain piping in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION.

2.4.10 Ductwork

Provide ductwork in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION.

2.4.11 Temperature Controls

Temperature controls shall be in accordance with Section 23 09 23.02 22 BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS.

2.5 FINISHES

2.5.1 Coil Corrosion Protection

Provide coil with a uniformly applied epoxy electrodeposition, phenolic, or vinyl type coating to all coil surface areas without material bridging between fins. Submit product data on the type coating selected, the coating thickness, the application process used, the estimated heat transfer loss of the coil, and verification of conformance with the salt spray test requirement. Coating must be applied at either the coil or coating manufacturer's factory. Coating process must ensure complete coil encapsulation. Coating must be capable of withstanding a minimum 3000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution.

2.5.2 Equipment and Components Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, must be factory finished with the manufacturer's standard finish, except that items located outside of buildings must have weather resistant finishes that will withstand 3000 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen must show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used must be coated with a zinc-rich coating conforming to ASTM D520, Type I.

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 must show no evidence of softening, blistering, cracking, crazing, flaking, loss of adhesion, or "bridging" between the fins.

2.5.2.1 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 must be 2.5 to 3.0 mils.

2.5.2.2 Chemical Conversion Coating with Polyelastomer Finish Coat

Dip coils in a chemical conversion solution to molecularly deposit a corrosion resistant coating by electrolysis action. Chemical conversion coatings must conform to MIL-DTL-5541, Class 1A. Cure conversion coating at a temperature of 110 to 140 degrees F for a minimum of 3 hours. Coat coil surfaces with a complex polymer primer with a dry film thickness of 1 mil. Cure primer coat for a minimum of 1 hour. Using dip tank method, provide three coats of a complex polyelastomer finish coat. After each of the first two finish coats, cure the coils for 1 hour. Following the third coat, spray a fog coat of an inert sealer on the coil surfaces. Total dry film thickness must be 2.5 to 3.0 mils. Cure finish coat for a minimum of 3 hours. Coating materials must have 300 percent flexibility, operate in temperatures of minus 50 to plus 220 degrees F, and protect against atmospheres of a pH range of 1 to 14.

2.5.2.3 Vinyl Coating

Apply coating using an airless fog nozzle. For each coat, make at least two passes with the nozzle. Materials to be applied are as follows:

a. Total dry film thickness, 6.5 mils maximum

b. Vinyl Primer, 24 percent solids by volume: One coat 2 mils thick

c. Vinyl Copolymer, 30 percent solids by volume: One coat 4.5 mils thick

2.5.3 Factory Applied Insulation

Refrigeration equipment must be provided with factory installed insulation on surfaces subject to sweating including the suction line piping. Where motors are the gas-cooled type, factory installed insulation must be provided on the cold-gas inlet connection to the motor in accordance with manufacturer's standard practice. Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors must have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces must have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes must be determined by ASTM E84. Insulation must 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 must be tested as a composite material. Jackets, facings, and adhesives must 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.

2.6 TESTS, INSPECTIONS, AND VERIFICATIONS

All manufactured units must be inspected and tested, and documentation provided to demonstrate that each unit is in compliance with ANSI/AHRI and UL requirements and that the minimum efficiency requirements of ASHRAE 90.1 - IP have been met.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, perform Verification of Dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.2 INSTALLATION

Perform work in accordance with the manufacturer's published diagrams, recommendations, and equipment warranty requirements. Where equipment is specified to conform to the requirements of ASME BPVC SEC VIII D1and ASME BPVC SEC IX, the design, fabrication, and installation of the system must conform to ASME BPVC SEC VIII D1 and ASME BPVC SEC IX.

3.2.1 Equipment

Provide refrigeration equipment conforming to ASHRAE 15 & 34. Provide necessary supports for all equipment, appurtenances, and pipe as required, including frames or supports for compressors, pumps, cooling towers, condensers, and similar items. Isolate compressors from the building structure. If mechanical vibration isolators are not provided, provide vibration absorbing foundations. Each foundation must include isolation units consisting of machine and floor or foundation fastenings, together with intermediate isolation material. Other floor-mounted equipment must be set on not less than a 6 inch concrete pad doweled in place. Concrete foundations for floor mounted pumps must have a mass equivalent to three times the weight of the components, pump, base plate, and motor to be supported. In lieu of concrete pad foundation, concrete pedestal block with isolators placed between the pedestal block and the floor may be provided. Concrete pedestal block must be of mass not less than three times the combined pump, motor, and base weights. Isolators must be selected and sized based on load-bearing requirements and the lowest frequency of vibration to be isolated. Isolators must limit vibration to 10 percent at lowest equipment rpm. Provide lines connected to pumps mounted on pedestal blocks with flexible connectors. Provide foundation drawings, bolt-setting information, and foundation bolts prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Concrete for foundations must be as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE. Equipment must be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions.

3.2.2 Field Applied Insulation

Apply field applied insulation as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS, except as defined differently herein.

3.2.3 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section 09 90 00 PAINTS AND COATINGS.

3.3 CLEANING AND ADJUSTING

Equipment must be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters must be provided for all fans that

are operated during construction, and new filters must be installed after all construction dirt has been removed from the building. System must be maintained in this clean condition until final acceptance. Bearings must be properly lubricated with oil or grease as recommended by the manufacturer. Belts must be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment must be adjusted to setting indicated or directed. Fans must be adjusted to the speed indicated by the manufacturer to meet specified conditions. Testing, adjusting, and balancing must be as specified in Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS.

3.4 REFRIGERANT TESTS, CHARGING, AND START-UP

Split-system refrigerant piping systems must be tested and charged as specified in Section 23 23 00 REFRIGERANT PIPING. Packaged refrigerant systems which are factory charged must be checked for refrigerant and oil capacity to verify proper refrigerant levels in accordance with manufacturer's recommendations. Following charging, packaged systems must be tested for leaks with a halide torch or an electronic leak detector. Submit 6 copies of each test containing the information described below in bound 8-1/2 by 11 inch booklets. Individual reports must be submitted for the refrigerant system tests.

a. The date the tests were performed.
b. A list of equipment used, with calibration certifications.
c. Initial test summaries.
d. Repairs/adjustments performed.
e. Final test results.

3.4.1 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system must immediately be isolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. Under no circumstances must the refrigerant be discharged into the atmosphere.

3.4.2 Contractor's Responsibility

Take steps, at all times during the installation and testing of the refrigeration system, to prevent the release of refrigerants into the atmosphere. The steps must 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 must more than 3 ounces of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year must 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.

3.5 SYSTEM PERFORMANCE TESTS

Before each refrigeration system is accepted, conduct tests to demonstrate the general operating characteristics of all equipment by a registered professional engineer or an approved manufacturer's start-up representative experienced in system start-up and testing, at such times as directed. Six copies of the report provided in bound 8-1/2 by 11 inch booklets. The report must document compliance with the specified

performance criteria upon completion and testing of the system. The report must indicate the number of days covered by the tests and any conclusions as to the adequacy of the system.

For equipment providing heating and cooling the system performance tests must be performed during the heating and cooling seasons.

a. Submit a schedule, at least 2 weeks prior to the start of related testing, for the system performance tests. The schedules must identify the proposed date, time, and location for each test. Tests must cover a period of not less than 48 hours for each system and must demonstrate that the entire system is functioning in accordance with the drawings and specifications.

b. Make corrections and adjustments, as necessary, tests must be re-conducted to demonstrate that the entire system is functioning as specified. Prior to acceptance, install and tighten service valve seal caps and blanks over gauge points. Replace any refrigerant lost during the system startup.

c. If tests do not demonstrate satisfactory system performance, correct deficiencies and retest the system. 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.

d. Coordinate field tests with Section 23 05 93.00 22 TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS. Submit 6 copies of the report provided in bound 8-1/2 by 11 inch booklets. The report must document compliance with the specified performance criteria upon completion and testing of the system. The report must indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. Submit the report including the following information (where values are taken at least three different times at outside dry-bulb temperatures that are at least 5 degrees F apart):

(1) Date and outside weather conditions.

(2) The load on the system based on the following:

(a) The refrigerant used in the system.
(b) Condensing temperature and pressure.
(c) Suction temperature and pressure.
(d) Ambient, condensing and coolant temperatures.
(e) Running current, voltage and proper phase sequence for each phase of all motors.

(3) The actual on-site setting of operating and safety controls.

(4) Thermostatic expansion valve superheat - value as determined by field test.

(5) Subcooling.

(6) High and low refrigerant temperature switch set-points

(7) Low oil pressure switch set-point.

(8) Defrost system timer and thermostat set-points.

(9) Moisture content.

(10) Capacity control set-points.

(11) Field data and adjustments which affect unit performance and energy consumption.

(12) Field adjustments and settings which were not permanently marked as an integral part of a device.

3.6 MAINTENANCE

3.6.1 EXTRA MATERIALS

Submit spare parts data for each different item of equipment specified, after approval of detail drawings and not later than 2 months prior to the date of beneficial occupancy. Include in the data a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

3.6.2 Maintenance Service

Submit a certified list of qualified permanent service organizations, which includes their addresses and qualifications, for support of the equipment. The service organizations must 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.

-- End of Section --

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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.

This Section refers to Security Requirements Guide (SRGs) and Security Technical Implementation Guide (STIGs). STIGs and SRGs are available online at the Information Assurance Support Environment (IASE) website at https://public.cyber.mil/stigs/downloads/ and an SRG/STIG Applicability Guide and Collection Tool is available at https://public.cyber.mil/stigs/SCAP/. Not all control system components have applicable STIGs or SRGs. The "Control Systems SRG" does not apply to work performed under this Section; all requirements within this section to apply applicable SRGs DO NOT include the "Control Systems SRG".

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.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 802.1x	(2010) Local and Metropolitan Area Networks - Port Based Network Access Control

INTERNET ENGINEERING TASK FORCE (IETF)

IETF RFC 2819	(2000) Remote Network Monitoring (RMON) Management Information Base (MIB)

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST FIPS 140-2	(2001) Security Requirements for Cryptographic Modules
NIST FIPS 201-2	(2013) Personal Identity Verification (PIV) of Federal Employees and Contractors

U.S. DEPARTMENT OF DEFENSE (DOD)

DODI 8551.01	(2014) Ports, Protocols, and Services Management (PPSM)
DTM 08-060	(2008) Policy on Use of Department of Defense (DoD) Information Systems - Standard Consent Banner and User Agreement

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.

Note that the operating system Administrator Account may be different than Administrator Accounts for applications hosted on that operating system. Also, most controllers will not have any support for accounts and will therefore not have an 'Aministrator Account'.

1.3.2 Computer

A computer is one of the following:

a. a device running a non-embedded desktop or server version of Microsoft Windows

b. a device running a non-embedded version of MacOS

c. a device running a non-embedded version of Linux

d. a device running a version or derivative of the Android Operating System, where Android is considered separate from Linux

e. a device running a version of Apple iOS

Unless otherwise indicated or clear from context use of the word "device" in this Section includes computers.

1.3.3 Controller

A device other than a computer or Ethernet switch. For Fire Protection systems this includes fire alarm control panels, remote operating consoles, and remote annunciators.

1.3.4 Mission Space

A device or media is in mission space if physical access to the device or media is controlled by the organization served by the device. For example, a VAV box controller in a suspended ceiling is in mission space if the VAV box serves that room; an electrical switchgear in an electrical room or an AHU in a mechanical room or on a rooftop may still be considered to be in mission space if the organization (mission) served by that switchgear or AHU controls access to the electrical room, mechanical room or rooftop.

1.3.5 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.

1.3.6 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).

1.3.6.1 Wireless Network Connected

Any device that supports wireless network communication is network connected to a wireless network, regardless of whether the device is communicating using wireless. Unless physically disabled, devices with wireless transceivers support wireless, it is not sufficient to disable the wireless in software.

1.3.7 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 (some network protocols allow sending network signals over power wiring).

1.3.8 User Account Support Levels

The support for user accounts is categorized in this Section as one of three levels:

1.3.8.1 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.

1.3.8.2 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.

1.3.8.3 NOT Supported

Device does not support any Access Enforcement therefore the whole concept of "account" is meaningless.

1.3.9 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.

1.3.10 Card Reader

A card reader is an input/output device whose primary function is to assist in two-factor authentication. A card reader must have an interface to read data from a card and may be able to write data to a card. A card reader may have a means (such as buttons, keypad, touchscreen, etc.) for a user to input a PIN or password, as well as a limited display.

1.3.11 User Interface

A User Interface (UI) is something other than a Manual Local Input or Card Reader that allows a person to interact with the system or device. Note that while a Card Reader is not by itself a User Interface, a User Interface may contain a Card Reader in order for it to authenticate its user. Within control systems, there are a wide range of User Interfaces.

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).

1.3.11.1 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".

1.3.11.2 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.

1.3.11.3 Types of User Interface (by capability)

User interfaces are also categorized by their capabilities as being Read Only, Limited, or Full.

1.3.11.3.1 Read-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.

Examples of a Read Only User Interfaces are a) a publicly viewable "energy dashboard" showing weather data and energy usage within a building and b) digital wayfinding signage.

1.3.11.3.2 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.

Two examples of LIMITED UIs are: a) a variable speed drive has a Limited Local User Interface which allows the user to change properties within the drive, but does not allow affecting things outside the drive; and b) a typical home WiFi Router has a Limited Remote User Interface which allows configuration of the Router, but does not allow direct interaction with other devices.

1.3.11.3.3 Full User Interface

A Full User Interface can alter information in devices outside the device with the user interface. For example, a typical Local Display Panel is a Full Local User Interface while a browser-based front end is a Full Remote User Interface.

1.3.11.3.4 View-Only User Interface

See Read-Only User Interface

1.3.11.4 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.

1.3.11.4.1 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)).

1.3.11.4.2 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 for Fire Alarm Systems are privileged user interfaces as indicated and shown, or when another requirement of this Section establishes they are privileged. For all other systems, 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. For Fire Protection Systems, User Interfaces that can inhibit or force the activation of a fire suppression system (e.g. such as for a pre-action or deluge system) are privileged user interfaces.

f. Writeable User Interfaces in Electronic Security Systems (ESS) are privileged user interfaces.

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.

1.3.12 Wireless Network

Any network that communicates without using wires or fiber optics as the communication media. Wireless networks include: WiFi, Bluetooth, ZigBee, cellular, satellite, 900 MHz radio, 2.4 GHz, free space optical, point-to-point laser, and IR.

1.3.13 Wired Broadcast Network

Wired Broadcast Networks are any network, such as powerline carrier networks and modem (wired telephony), that use wire-based technologies where there is not a clearly defined boundary for signal propagation.

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 Computer Access Point of Contact: The Contracting Office Representative (COR)

b. HTTPS Certificate Point of Contact: The Contracting Office Representative (COR)

c. Email Address Point of Contact: The Contracting Office Representative (COR)

d. Password Point of Contact: The Contracting Office Representative (COR)

e. Mobile Code Point of Contact: The Contracting Office Representative (COR)

f. PKI Infrastructure 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. If requesting permission for wireless or wired broadcast communication, the Wireless and Wired Broadcast Communication Request submittal must be approved prior to control system device selection and installation.

b. If requesting permission for alternate account lock permissions, the Device Account Lock Exception Request must be approved prior to control system device selection and installation.

c. If requesting permission for the use of a device with multiple physical connections to IP networks, the Multiple IP Connection Device Request must be approved prior to control system device selection and installation.

d. Wireless testing may be required as part of the control system testing. See requirements for the Wireless Communication Test Report submittal.

e. If the Device Audit Record Upload Software is to be installed on a computer not being provided as part of the control system, coordination is required to identify the computer on which to install the software.

f. 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.

g. Cybersecurity testing support must be coordinated across control systems and with the Government cybersecurity testing schedule.

h. Passwords must be coordinated with the indicated contact for the project site.

i. If applicable, HTTPS web server certificates must be obtained from the indicated HTTPS Certificate Point of Contact.

j. Contractor Computer Cybersecurity Compliance Statements must be provided for each contractor using contractor owned computers.

1.5 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Wireless and Wired Broadcast Communication Request

Device Account Lock Exception Request

Multiple Ethernet Connection Device Request

Contractor Computer Cybersecurity Compliance Statements

Contractor Temporary Network Cybersecurity Compliance Statements

Cybersecurity Interconnection Schedule

Protection of Information At Rest Proposal

Proposed STIG and SRG Applicability Report

SD-02 Shop Drawings

Network Communication Report

Cybersecurity Riser Diagram

SD-03 Product Data

Control System Cybersecurity Documentation

SD-06 Test Reports

Wireless Communication Test Report

Control System Cybersecurity Testing Procedures

Control System Cybersecurity Testing Report

SD-07 Certificates

Software Licenses

SD-11 Closeout Submittals

Password Change Summary Report

Enclosure Keys

Software and Configuration Backups

Auditing Front End Software

Device Audit Record Upload Software

System Maintenance Tool Software

Control System Scanning Tools

STIG, SRG and Vendor Guide Compliance Result Report

Control System Inventory Report

Integrity Verification Software

1.6 QUALITY CONTROL

1.7 CYBERSECURITY DOCUMENTATION

{For Government Reference Only: This subpart (and its subparts) relates to PL-7; CCI-003071}

1.7.1 Proposed STIG and SRG Applicability Report

For each model of network connected or network infrastructure device, use the DISA SRG/STIG Applicability Guide and Collection Tool (available at https://public.cyber.mil/stigs/SCAP/to identify applicable STIGs or SRGs and provide a report indicating applicable STIGs and SRGs for each model.

1.7.2 Cybersecurity Interconnection Schedule

{For Government Reference Only: This subpart relates to CA-3(b), PL-8, SC-7(9), SC-7(11); CCI-000258, CCI-003072, CCI-003073, CCI-003075, CCI-002398, CCI-002399, CCI-002401, CCI-002402, CCI-002403. For MODERATE Impact systems, this subpart also relates to SC-7; CCI-001126, CCI-001109}

Provide a completed Cybersecurity Interconnection Schedule documenting network connections between the installed system and other systems. Provide the following information for each device directly communicating between systems: Device Identifier, Device Description, Transport layer Protocol, Network Address, Port (if applicable), MAC (Layer 2) address (if applicable), Media, Application Protocol, Service (if applicable), Descriptive Purpose of communication. For communication with other authorized systems also provide the Foreign Destination and POC for Destination. For MODERATE Impact Systems: Also describe the impact of loss of the connection on the control system. 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 Cybersecurity Interconnection Schedule as an editable Microsoft Excel file (a template Cybersecurity Interconnection Schedule in Excel format is available at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-25-05-1

1.7.3 Network Communication Report

{For Government Reference Only: This subpart (and its subparts) relates to CA-9, PL-8; 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.

1.7.4 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 networked devices, including network infrastructure devices. 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.

1.7.5 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.

1.7.6 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.

1.7.7 STIG, SRG and Vendor Guide Compliance Result Report

For every component (device or software) with an applicable STIG or SRG in

the Proposed STIG and SRG Applicability Report, provide a result report documenting compliance with the STIG or SRG requirements. For components which are scannable by the SCAP (security content automation protocol) tool (available online at https://public.cyber.mil/stigs/scap), provide the SCAP report and raw scan results.

For every component (device or software) with manufacturer provided cybersecurity documentation, procedure, or method for secure configuration or installation, provide a report documenting how the component was configured and any deviation from the manufacturer instructions.

1.7.8 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.

1.7.8.1 Software Applications

For all software applications running on computers provide:

a. administrator documentation that describes secure configuration of the software {For Government Reference Only: relates to CCI-003124}

b. administrator documentation that describes secure installation of the software {For Government Reference Only: relates to CCI-003125}

c. administrator documentation that describes secure operation of the software {For Government Reference Only: relates to CCI-003124}

d. administrator documentation that describes effective use and maintenance of security functions or mechanisms for the software {For Government Reference Only: relates to CCI-003127}

e. administrator documentation that describes known vulnerabilities regarding configuration and use of administrative (i.e. privileged) functions for the software {For Government Reference Only: relates to CCI-003128}

f. user documentation that describes user-accessible security functions or mechanisms in the software and how to effectively use those security functions or mechanisms {For Government Reference Only: relates to CCI-003129}

g. user documentation that describes methods for user interaction which enables individuals to use the software in a more secure manner {For Government Reference Only: relates to CCI-003130}

h. user documentation that describes user responsibilities in maintaining the security of the software {For Government Reference Only: relates to CCI-003131}

1.7.8.2 For HVAC Control System Devices

1.7.8.2.1 HVAC 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}

1.7.8.2.2 All Other HVAC Control System Devices

For all HVAC 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}

1.7.8.3 For Lighting Control System Devices

1.7.8.3.1 Lighting Control System Devices FULLY Supporting User Accounts

For all Lighting 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}

1.7.8.3.2 All Other Lighting Control System Devices

For all Lighting 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}

1.7.8.4 Default Requirements for Control System Devices

For control system devices where Control System Cybersecurity Documentation requirements are not otherwise indicated in this Section, provide:

a. Documentation that describes secure configuration of the device {For Government Reference Only: relates to CCI-003124}

b. Documentation that describes secure installation of the device {For Government Reference Only: relates to CCI-003125}

c. Documentation that describes secure operation of the device {For Government Reference Only: relates to CCI-003124}

d. Documentation that describes effective use and maintenance of security functions or mechanisms for the device {For Government Reference Only: relates to CCI-003127}

e. 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}

f. Documentation that describes user-accessible security functions or mechanisms in the device and how to effectively use those security functions or mechanisms {For Government Reference Only: relates to CCI-003129}

g. 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}

h. Documentation that describes user responsibilities in maintaining the security of the device {For Government Reference Only: relates to CCI-003131}

1.8 SOFTWARE LICENSING

{For Government Reference Only: This subpart (and its subparts) relates to SI-2(a), SI-2(c), SI-7(14); CCI-001227, CCI-002605, CCI-002737}

For all software provided that has not already been licensed to the government or project site, provide a license to the Government for a period of no less than 5 years, and the license must also include the following software updates:

a. Security and bug-fix patches issued by the software manufacturer.

b. Security patches to address any vulnerability identified in the National Vulnerability Database at http://nvd.nist.gov with a Common Vulnerability Scoring System (CVSS) severity rating of MEDIUM or higher.

Provide a single Software Licenses submittal with documentation of the software licenses for all software provided

1.9 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.

1.9.1 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:

1.9.1.1 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.

1.9.1.2 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.

1.9.1.3 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.

1.9.1.4 User-Based Authentication

Each user must have a unique account; sharing of a single account between multiple users is prohibited.

1.9.1.5 Demonstration of Compliance

The Government has the right to require demonstration of computer compliance with these requirements at any time during the project.

1.9.1.6 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.

1.9.2 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:

1.9.2.1 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.

1.9.3 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.

1.9.4 Temporary Wireless IP Networks

In addition to the other requirements on temporary IP networks, temporary wireless IP (WiFi) networks, when permitted, must not interfere with existing wireless networks, must use WPA2 security and must not broadcast the network name (SSID). Network names (SSID) for wireless networks must be changed from their default values.

1.9.5 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.

1.9.6 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.

1.10 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.

2.1 ETHERNET SWITCH

Provide Open Systems Interconnection (OSI) Layer 2 Ethernet switches with the following capabilities, and with an interface to support switch configuration for these capabilities:

2.1.1 Required Functionality

Switches must:

a. Copper Ethernet ports must auto negotiate for 10, 100 and 1000 megabits-per-second links.

b. Be capable of implementing port level access control by MAC address and limit the number of MAC addresses to one MAC address per port.

c. For MODERATE Impact Systems, be capable of implementing per-port access control lists (ACLs) where the list can be filtered by source and destination IP addresses, and by source and destination UDP or TCP

ports.

c. For LOW Impact Systems, be capable of implementing per-port access control lists (ACLs) where the list can be filtered by source and destination IP addresses, and by source and destination UDP or TCP ports.

d. Support Remote Network Monitoring (RMON) Port Analysis in accordance with IETF RFC 2819

e. Configure target port and analysis port such that switch clones all target port traffic to analysis port.

2.1.2 Configuration Requirements

Switches must:

a. Support configuration save and restore.

b. Support both manual IP address assignment and acquisition of a dynamic IP address via Dynamic Host Configuration Protocol (DHCP).

c. Be capable of limiting access for configuration to one or more of: a web interface using HTTPS, a command line interface using SSH, or an SNMP connection using SNMP version 3 or later.

2.2 DAISY CHAIN IP CONTROLLERS

Controllers used as Daisy Chain IP Controllers must be IP controllers with exactly two Ethernet network connections and basic built-in switch capabilities to allow implementation of an Ethernet network in a daisy chain architecture. Switches incorporated by Daisy Chain IP Controllers are not required to meet the requirements for Ethernet Switches as defined in this Section.

2.3 DATABASE AND WEB SERVER SOFTWARE FOR MODERATE IMPACT SYSTEMS

{For Government Reference Only: This subpart (and its subparts) relate to RA-5(1), RA-5(5); CCI-001062, CCI-001067, CCI-001645, CCI-002906}

All computer-based databases must use Microsoft SQL Server or Oracle or MySQL. All computer-based web interfaces must use Internet Information Services (IIS) or Apache as the web server.

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 Information Flow Enforcement In MODERATE Impact Systems

{For Government Reference Only: This subpart (and its subparts) relate to AC-4; CCI-001368, CCI-001414, CCI-001548, CCI-001549, CCI-001550, CCI-001551}

Install and configure Ethernet switches to block all traffic on all ports not required by the control protocol.

3.2.2 Wireless and Wired Broadcast Communication for Fire Protection Systems

The use of wireless and wired broadcast communication for fire protection systems within a facility is prohibited. Wireless communication may be used to provide communication from the fire protection system in a facility to the central monitoring station. Communication between the fire protection system and the central monitoring station must be via FIPS 140-2 certified devices.

3.2.3 Wireless and Wired Broadcast Communication for Systems Other than Fire Protection Systems

{For Government Reference Only: This subpart (and its subparts) relates to AC-18, AC-18(3); CCI-001438, CCI-001439, CCI-002323, CCI-001441, CCI-002252}

Unless explicitly authorized by the Government, do not use any wireless or wired broadcast communication. If requesting authorization for wireless or wired broadcast communication, wired broadcast media such as powerline carrier is preferred to wireless.

3.2.3.1 Wireless and Wired Broadcast IP Communications

Do not install wireless or wired broadcast IP networks; do not install a wireless access point; do not install or configure an ad-hoc wireless network; do not install or configure a WiFi Direct communication.

When explicitly authorized by the Government, wireless IP communication may be used to communicate with an existing wireless network.

3.2.3.2 Non-IP Wireless Communication

For LOW Impact Systems: When non-IP wireless communication is explicitly authorized by the Government, use the maximum level of encryption supported by the specific protocol employed and select signal strength and radiated power to the minimum necessary for reliable communication.

For MODERATE Impact Systems: When non-IP wireless communication is explicitly authorized by the Government, the radios must meet NIST FIPS 140-2 Level 2.

3.2.3.3 Wireless and Wired Broadcast Communication Request

Provide a report documenting the proposed use of wireless or wired broadcast communication prior to device selection using the Wireless and

Wired Broadcast Communication Request Schedule at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-25-05-1 If there is no proposed use of wireless or wired broadcast communication, provide a document indicating this instead of the Request Schedule.

For each device proposed to use wireless or wired broadcast communication show: the device identifier, a description of the device, the location of the device, the device identifiers of other devices communicating with the device, the protocol used for communication, encryption type and strength. For wireless communication, also show: RF Frequency, Radiated Power in dBm (decibel with a milliwatt reference), free-space range, and the expected as-installed range.

3.2.3.4 Wireless Communication Testing

Conduct testing of wireless communication for all devices indicated on the approved Wireless and Wired Broadcast Communication Request as requiring testing.

To test wireless communication, test for wireless network reception at multiple points along the wireless test boundary in the vicinity of the wireless device, and record whether a network connection can be established at each point. The wireless test boundary is approved by the Contracting Officer. If wireless testing is required, provide a Wireless Communication Test Report documenting the testing points and results at each point for each wireless device.

3.2.4 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.

3.2.5 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. For Moderate Impact Systems, this subpart (and its subparts) also relates to SC-5(1), SC-5(2); CCI-001094 CCI-001095}

IP Networks must be Ethernet networks and must use switches which are Ethernet Switches or Daisy Chain IP Controllers 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.

For MODERATE Impact Systems, unless explicitly authorized, do not use IP networks if the same control functionality is available through the use of non-IP networks.

3.2.5.1 IP Network Routers

Do not install any device that performs IP routing.

3.2.5.2 IP Devices With Multiple Ethernet Connection

Except for Ethernet Switches and Daisy Chain IP Controllers, devices must not have more than one Ethernet connection to IP networks unless doing so is required by the project specifications and the specific application is approved. If a device with Multiple Ethernet Connections to IP networks is required, provide a Multiple Ethernet Connection Device Request using the Multiple Ethernet Connection Device Request Template at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-25-05-1 to request approval for each device. If a device with Multiple Ethernet Connections to IP networks is not required, instead provide a document stating that no approval is being requested.

3.2.6 Cryptographic Protection

{For Government Reference Only: This subpart relates to IA-2(9), IA-3(1), SC-8, SC-13, SC-23(1), SC-23(3); CCI-001942, CCI-001959, CCI-001967, CCI-002418, CCI-002449, CCI-002450, CCI-001185, CCI-001188, CCI-001664.}

All remote user interfaces must use HTTPS for all traffic between the user interface client and user interface server.

For devices that have STIG/SRGs related to cryptographic protection (CCI-002450), comply with the requirements of those STIG/SRGs. Ensure that network traffic is encrypted using NSA-approved cryptography; provision of digital signatures and hashing, and FIPS-validated cryptography.

3.2.7 Device Identification and Authentication

{For Government Reference Only: This subpart (and its subparts) relates to IA-3; CCI-000777, CCI-000778, CCI-001958. For MODERATE Impact systems, this subpart (and its subparts) also relates to SC-23, SC-23(5); CCI-001184, CCI-002470.}

All computers must support IEEE 802.1x for device authentication to the network.

3.2.7.1 For HVAC Control System Devices

Devices using HTTP as a control protocol must use HTTPS instead. Devices using Fox Protocol must support IEEE 802.1x.

3.2.7.2 For Lighting Control System Devices

Devices using HTTP as a control protocol must use HTTPS instead. Devices using Fox Protocol must support IEEE 802.1x.

3.2.7.3 Default Requirements for Control System Devices

For control system devices where Device Identification and Authentication requirements are not otherwise indicated in this Section: Devices using HTTP as a control protocol must use HTTPS instead.

3.2.8 Cryptographic Module Authentication

{For Government Reference Only: This subpart (and its subparts) relates to IA-7; CCI-000803}

For devices (including but not limited to NIST FIPS 140-2 compliant radios) that have STIG/SRGs related to cryptographic module authentication (CCI-000803), comply with the requirements of those STIG/SRGs.

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-001558, CCI-002221, CCI-002222, CCI-002223, CCI-002235, CCI-000039, CCI-001419, CCI-002234, CCI-001812, and CCI-000764. For MODERATE Impact systems, this subpart (and its subparts) also relate to AC-2 (2), AC-2(3), AC-2(4), AC-6(1), and CM-5(1); CCI-001361, CCI-000017, CCI-000217, CCI-000018, CCI-001403, CCI-001404, CCI-001405, CCI-002130, CCI-001683, CCI-001684, CCI-001685, CCI-001686, CCI-002132, CCI-001558, CCI-002221, CCI-002222, CCI-002223, CCI-001813.}

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 Computers

All computer operating systems must FULLY support user accounts and implement accounts for access. Each control system software application not supporting accounts and running on a computer must be installed such that use of the software is restricted by the computer operating system to specific users.

Applications running on computers must not require the user be logged in to a computer operating system administrator account for normal operation. It is permissible to require the computer operating system administrator account for initial application installation and configuration.

3.3.1.2 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 "KEY": 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 located inside mission space. For Local Limited (not FULL) interfaces, the user interface must either a) be located within mission space or b) 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.

g. Entries of the form "X and Y" must meet both the requirement indicated for X and the requirement indicated for Y. For example, an entry of "MINIMALLY and Physical Security" indicates the user interface must both MINIMALLY support accounts and have physical security.

h. Entries of the form "X or Y" must meet either the requirement indicated for X or the requirement indicated for Y.

3.3.1.2.1 HVAC Control Systems

User Interface Requirements for LOW Impact HVAC Control Systems	
User Interface Type	**Access Control Requirement**
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	None Required
Local Limited, Privileged	MINIMALLY
Local Full	MINIMALLY
Remote Read Only	None Required
Remote Limited, Non-Privileged	MINIMALLY

User Interface Requirements for LOW Impact HVAC Control Systems	
User Interface Type	**Access Control Requirement**
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged	

User Interface Requirements for MODERATE Impact HVAC Control Systems	
User Interface Type	**Access Control Requirement** (See note 3)
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	None Required
Local Limited, Privileged	MINIMALLY and Physical Security
Local Full	MINIMALLY and Physical Security
Remote Read Only	None Required
Remote Limited, Non-Privileged	FULLY
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged 3)Devices outside mission space require physical security protections as indicated (in "PHYSICAL SECURITY IN MODERATE IMPACT SYSTEMS")	

3.3.1.2.2 Lighting Control Systems

User Interface Requirements for LOW Impact Lighting Control Systems	
User Interface Type	**Access Control Requirement**
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	None Required
Local Limited, Privileged	MINIMALLY
Local Full	MINIMALLY

User Interface Requirements for LOW Impact Lighting Control Systems	
User Interface Type	**Access Control Requirement**
Remote Read Only	None Required
Remote Limited, Non-Privileged	MINIMALLY
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged	

User Interface Requirements for MODERATE Impact Lighting Control Systems	
User Interface Type	**Access Control Requirement** (See note 3)
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	None Required
Local Limited, Privileged	MINIMALLY and Physical Security
Local Full	MINIMALLY and Physical Security
Remote Read Only	None Required
Remote Limited, Non-Privileged	FULLY
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged 3)Devices outside mission space require physical security protections as indicated (in "PHYSICAL SECURITY IN MODERATE IMPACT SYSTEMS")	

3.3.1.2.3 Electronic Security Systems (ESS)

User Interface Requirements for LOW Impact Electronic Security Systems	
User Interface Type	**Access Control Requirement**
Local Read Only (see note 1)	KEY
Local Limited, Non-privileged	NA

User Interface Requirements for LOW Impact Electronic Security Systems	
User Interface Type	**Access Control Requirement**
Local Limited, Privileged	MINIMALLY and KEY
Local Full	FULLY and Physical Security
Remote Read Only	None Required
Remote Limited, Non-Privileged	NA
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged	

User Interface Requirements for MODERATE Impact Electronic Security Systems	
User Interface Type	**Access Control Requirement** (See note 3)
Local Read Only (see note 1)	KEY
Local Limited, Non-privileged	NA
Local Limited, Privileged	FULLY
Local Full	FULLY and Physical Security
Remote Read Only	None Required
Remote Limited, Non-Privileged	NA
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged 3)Devices outside mission space require physical security protections as indicated (in "PHYSICAL SECURITY IN MODERATE IMPACT SYSTEMS")	

3.3.1.2.4 Fire Protection Systems

User Interface Requirements for LOW Impact Fire Protection Systems	
User Interface Type	**Access Control Requirement**
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	KEY or MINIMALLY
Local Limited, Privileged	KEY and Physical Security
Local Full	KEY
Remote Read Only	None Required
Remote Limited, Non-Privileged	MINIMALLY
Remote Limited, Privileged AND Remote Full	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged	

User Interface Requirements for MODERATE Impact Fire Protection Systems	
User Interface Type	**Access Control Requirement** (See note 2)
Local Read Only	None Required
Local Limited, Non-privileged	KEY or MINIMALLY
Local Limited, Privileged	KEY and Physical Security
Local Full	KEY
Remote Read Only	MINIMALLY
Remote Limited, Non-Privileged	FULLY
Remote Limited, Privileged AND Remote Full	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Devices outside mission space require physical security protections as indicated (in "PHYSICAL SECURITY IN MODERATE IMPACT SYSTEMS")	

3.3.1.2.5 Default Requirements for Other Control Systems

For control system devices where User Interface Requirements are not otherwise indicated in this Section, use the Default User Interface Requirements tables.

Default User Interface Requirements for LOW Impact Control Systems	
User Interface Type	**Access Control Requirement**
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	None Required
Local Limited, Privileged	MINIMALLY
Local Full	MINIMALLY
Remote Read Only	None Required
Remote Limited, Non-Privileged	MINIMALLY
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged	

Default User Interface Requirements for MODERATE Impact Control Systems	
User Interface Type	**Access Control Requirement** (See note 3)
Local Read Only (see note 1)	None Required
Local Limited, Non-privileged	None Required
Local Limited, Privileged	MINIMALLY and Physical Security
Local Full	MINIMALLY and Physical Security
Remote Read Only	None Required
Remote Limited, Non-Privileged	FULLY
Remote Limited, Privileged AND Remote Full (see note 2)	FULLY
Notes: 1)Local Read Only User Interfaces are always Non-Privileged 2)Remote Full User Interfaces are always Privileged 3)Devices outside mission space require physical security protections as indicated (in "PHYSICAL SECURITY IN MODERATE IMPACT SYSTEMS")	

3.3.1.3 Additional User Account Expiration Requirements In MODERATE Impact Systems:

In addition to other user account requirements, user account expiration and auditing must be configured as indicated.

3.3.1.3.1 For Control System Applications Running on Computers

If temporary accounts are supported, expire temporary accounts 72 hours after creation. Expire all other accounts after 35 days of inactivity.

3.3.1.3.2 For Other Control System Devices FULLY Supporting Accounts

If temporary accounts are supported, expire temporary accounts 72 hours after creation. Expire all other accounts after 365 days of inactivity.

3.3.2 Unsuccessful Logon Attempts

{For Government Reference Only: This subpart (and its subparts) relate to AC-7 (a), AC-7 (b); CCI-000043, CCI-000044, CCI-001423, CCI-002236, CCI-002237, CCI-002238}

Except for high availability user interfaces indicated as exempt, devices must meet the indicated requirements for handling unsuccessful logon attempts. If a device cannot meet these requirements, document device capabilities to protect from subsequent logon attempts and propose alternate protections in a Device Account Lock Exception Request submittal. Do not implement alternate protection measures in lieu of the indicated requirements without explicit permission from the Government. If no Device Account Lock Exceptions are requested, provide a document stating that no approval is being requested as the Device Account Lock Exception Request.

3.3.2.1 Devices MINIMALLY Supporting Accounts

For LOW Impact Systems: Devices which MINIMALLY (but not FULLY) support accounts are not required to lock based on unsuccessful logon attempts.

For MODERATE Impact Systems: Devices which MINIMALLY (but not FULLY) support accounts must lock the user account account after five consecutive failed login attempts and must unlock the user account after 60 minutes have elapsed without an unsuccessful login attempt or by a successful login to a separate administrator account.

3.3.2.2 Devices FULLY Supporting Accounts

Devices which FULLY support accounts must meet the following requirements.

a. It must lock the user account when three unsuccessful logon attempts occur within a 15 minute interval.

b. Once an account is locked, the account must stay locked until unlocked by an administrator. If the account being locked is the sole administrator account on the device, the account must stay locked for 1 hour and then automatically unlock.

c. Once the indicated number of unsuccessful logon attempts occurs, delay further logon prompts by 5 seconds.

3.3.3 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}

3.3.3.1 System Use Notification for Remote User Interfaces

Remote user interfaces must display a warning banner meeting the requirements of DTM 08-060 on screen.

3.3.3.2 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 meeting the requirements of DTM 08-060 on the user interface screen if capable of doing so and must have a permanently affixed label with an approved banner from DTM 08-060 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.

3.3.4 Session Lock and Session Termination Requirements In MODERATE Impact Systems:

{For Government Reference Only: This subpart (and its subparts) relates to AC-11(a), AC-11(b), AC-11(1), AC-12, SC-10; AC-10; CCI-000058, CCI-000059, CCI-000056, CCI-000057, CCI-000060, CCI-002360, CCI-002361, CCI-001133, CCI-001134, CCI-000054, CCI-000055, CCI-002252}

3.3.4.1 Session Termination

When session termination is required for a User Interface, the User Interface must implement session termination a) based on manual initiation, or b) based on lack of activity, or c) based on either manual initiation or lack of activity, as indicated.

Session Termination must result in logging out the user. A logged out User Interface may only perform actions as indicated in the "Permitted Actions Without Identification or Authentication" subpart of this Section or display a publicly viewable image or blank screen. User Interfaces must remain logged out (session terminated) until a user enters correct authentication information, which must initiate a new session. All User Interfaces running on computers and all Remote User Interfaces must also terminate network connections as part of session termination.

3.3.4.2 Session Lock

When session lock is required for a User Interface, the User Interface must implement session lock a) based on manual initiation, or b) based on lack of activity, or c) based on either manual initiation or lack of activity, as indicated.

Session lock must result in the User Interface being suspended and the user interface must display a publicly viewable image or blank screen. No interaction with the user interface must be possible until either a)

the same user enters valid authentication information, in which case that session must be continued, or b) until a different user enters valid authentication information at which point the first session must be terminated and a new session initiated for the new user.

3.3.4.3 Session Lock and Termination for Computers

User Interface sessions provided by computer operating systems must support the requirement for both Session Lock and Session Termination. Session Lock and Session Termination must be capable of being initiated by the user and must also be initiated by lack of activity. Session Lock must occur after 15 minutes of inactivity, and Session Termination must occur after 30 minutes total of inactivity (including, not in addition to, the time for Session Lock). When a user initiates a new session, terminate existing sessions if necessary to limit the total number of concurrent sessions to 1.

Other User Interface sessions running on computers (for local user interfaces) or hosted on a computer (for remote user interfaces) and supporting accounts must support user initiation of Session Termination. In addition, remote User Interface sessions must also initiate Session Termination after 30 minutes of inactivity.

3.3.4.4 Session Lock and Termination for Controllers

Writable Remote User Interfaces must support requirements for Session Termination, and must both be capable of being initiated by the user and initiated by lack of activity. Session Termination must initiate after 30 minutes of inactivity.

Local User Interfaces supporting accounts must support manual initiation of Session Termination. Privileged Local User Interfaces must also support timed initiation of Session Termination, with Session Termination initiated at 30 minutes of inactivity.

3.3.5 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.

3.3.6 Physical Security in MODERATE Impact Systems

{For Government Reference Only: This subpart relates to PE-3(1), PE-4, PE-5, SC-7(a), SC-7(c), SC-8, SC-8(1); CCI-000928, CCI-002926, CCI-000936, CCI-002930, CCI-002931, CCI-000937, CCI-001097, CCI-001109, CCI-002418, CCI-002419, CCI-002421.}

3.3.6.1 Physical Security for Media

3.3.6.1.1 Physical Security for Media Inside Mission Space

Install all non-IP network media located inside of the mission space in conduit. Install all IP network media located inside of the mission space in intermediate metallic conduit.

3.3.6.1.2 Physical Security for Media Outside Mission Space

Install all network media (both IP and non-IP) located outside of the mission space in rigid metallic conduit.

3.3.6.1.3 Physical Security for Non-Network Media in Fire Protection Systems

For Fire Suppression Systems which can be inhibited or forced to activate by manipulation of non-network wiring, install all non-network media outside of mission space, including analog and binary instrumentation wiring and power wiring, in rigid metallic conduit.

3.3.6.2 Physical Security for Devices

Install all devices (computers and controllers) which are located outside of mission space in lockable enclosures. (Recall that per definition of mission space, a room controlled by the mission is mission space regardless of whether it is contiguous with other mission space.)

Install all controllers connected to an IP network in lockable enclosures (both inside and outside of mission space).

3.3.6.2.1 Physical Security for Devices in Fire Protection Systems

For Fire Suppression systems with a release panel, install all components of the suppression system either inside mission space, or within locked enclosures. Components of these systems include: release panel, any relay or interface panels, analog and binary inputs or outputs, control valves, manual valves.

3.3.6.3 Physical Security for User Interfaces

Physical security requirements for User Interfaces are specified in the preceding paragraphs of this Section.

3.3.7 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. For MODERATE Impact systems, this subpart also relates to AC-6 (1), AC-6(10), AC-6(2), AC-6(9)IA-2(4), IA-5(13); CCI-001558, CCI-002221, CCI-002222, CCI-002223, CCI-002235, CCI-000039, CCI-001419, CCI-002234, CCI-000768, CCI-002007.}

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 user interfaces on a computer: inheriting the Identification and Authorization from the computer operating system, either by the operating system limiting access to specific applications by user, or by the application itself having permissions based on the user logged into the computer.

c. 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 Software and Applications Running on Computers

All software and applications running on computers supporting password-based authentication must enforce the following requirements:

a. Minimum password length of 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 minimum lifetime of 24 hours.

g. 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.

h. 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).

i. Passwords must be cryptographically protected during storage and transmission.

3.4.3.2 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.

3.4.3.3 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.

3.4.3.4 Passwords for Devices Minimally Supporting Accounts

Devices MINIMALLY supporting accounts must support passwords with a minimum length of four characters.

3.4.3.5 Password Configuration and Reporting

For all devices with a password, coordinate the changing of passwords with the project site following testing of the system but prior to turnover to the Government. Coordinate with Password Point of Contact to determine appropriate project site personnel to complete password changes. Accompany identified personnel to each device with a password and instruct personnel on the process of changing password. Record the time, date and personnel present when each device's password is changed and submit a Password Change Summary Report documenting this information.

Provide the Password Summary Report electronically in both PDF and Microsoft Excel.

3.4.4 Authenticator Feedback

{For Government Reference Only: This subpart relates to IA-6; CCI-000206}

Devices must never show authentication information, including passwords, on a display. Devices that momentarily display a character as it is entered, and then obscure the character, are acceptable. For devices that have STIGs or SRGs related to obscuring of authenticator feedback (CCI-000206), comply with the requirements of those STIGS/SRGs.

3.5 CYBERSECURITY AUDITING

Where an auditing requirement exists for email notification, notify via email the application administrator and Information System Security Officer (ISSO) of the event. Coordinate with the Email Address Point of Contact for email addresses. If outgoing email is not available to the system, configure the system for these notifications for future support of outgoing email.

3.5.1 Audit Events, Content of Audit Records, and Audit Generation

{For Government Reference Only: This subpart (and its subparts) relates to AU-2(a), AU-2(c), AU-2(d), AU-3, AU-10, AU-12, AU-13(3), AU-14(b), AU-14(1), AU-14(2), AU-14(3), CM-5(1), SC-7 (9); CCI-000123, CCI-001571, CCI-000125, CCI-001485, CCI-000130, CCI-000131, CCI-000132, CCI-012300133, CCI-000134, CCI-001487, CCI-000166, CCI-001899, CCI-000169, CCI-001459, CCI-000171, CCI-000172, CCI-001910, CCI-001914, CCI-001919, CCI-001464, CCI-001462, CCI-001920, CCI-001814, CCI-002400. For MODERATE Impact systems, this subpart (and its subparts) also relates to AU-3 (1); CCI-000135, CCI-001488}

For devices that have STIG/SRGs related to audit events, content of audit records or audit generation, comply with the requirements of those STIG/SRGs.

If auditing requirements can be met using existing control system alarm or event capabilities, those existing capabilities may be used to meet these requirements.

3.5.1.1 Computers

For each computer, provide the capability to select audited events and the content of audit logs. Configure computers to audit the indicated events, and to record the indicated information for each auditable event

3.5.1.1.1 Audited Events

Configure each computer to audit the following events:

a. Successful and unsuccessful attempts to access, modify, or delete privileges, security objects, security levels, or categories of information (e.g. classification levels)

b. Successful and unsuccessful logon attempts

c. Successful logouts

d. Privileged activities or other system level access

e. Concurrent logons from different workstations

f. Successful and unsuccessful accesses to objects

g. All program initiations

h. All direct access to the information system

i. All account creations, modifications, disabling, and terminations. For MODERATE Impact Systems, also provide email notification when these audit events occur.

j. All kernel module load, unload, and restart

3.5.1.1.2 Audit Event Information To Record

Configure each computer to record, for each auditable event, the following information (where applicable to the event):

a. What type of event occurred

b. When the event occurred

c. Where the event occurred

d. The source of the event

e. The outcome of the event

f. The identity of any individuals or subjects associated with the event

h. For MODERATE Impact Systems: For all privileged commands, full-text recording of the executed command and the user executing the command

For MODERATE Impact Systems: Audit records must provide sufficient detail

to reconstruct events to determine cause of compromise and magnitude of damage, malfunction, or security violation.

3.5.1.2 For HVAC Control System Controllers

3.5.1.2.1 HVAC Control System Controllers FULLY Supporting User Accounts

For each controller which FULLY supports accounts, provide the capability to select audited events and the content of audit logs. Configure controllers to audit the indicated events, and to record the indicated information for each auditable event.

3.5.1.2.1.1 Audited Events

Configure each controller to audit the following events:

a. Successful and unsuccessful logon attempts to the controller

b. Successful logouts

c. All account creations, modifications, disabling, and terminations. For MODERATE Impact Systems, also provide email notification when these audit events occur.

d. All controller shutdown and startup

e. For privileged user interfaces in MODERATE Impact Systems: All user commands.

3.5.1.2.1.2 Audit Event Information To Record

Configure each controller to record, for each auditable event, the following information (where applicable to the event):

a. what type of event occurred

b. when the event occurred

c. the identity of any individuals or subjects associated with the event

d. For privileged user interfaces in MODERATE Impact Systems: Full text recording of the executed command and the user executing the command.

For MODERATE Impact Systems: Audit records must provide sufficient detail to reconstruct events to determine cause of compromise and magnitude of damage, malfunction, or security violation.

3.5.1.2.2 Other HVAC Control System Controllers

There are no requirements to perform auditing at HVAC field controllers that do not FULLY support accounts.

3.5.1.3 For Lighting Control System Controller

3.5.1.3.1 Lighting Control System Controllers FULLY Supporting User Accounts

For each controller which FULLY supports accounts, provide the capability to select audited events and the content of audit logs. Configure

controllers to audit the indicated events, and to record the indicated information for each auditable event.

3.5.1.3.1.1 Audited Events

Configure each controller to audit the following events:

a. Successful and unsuccessful logon attempts to the controller

b. Successful logouts

c. All account creations, modifications, disabling, and terminations. For MODERATE Impact Systems, also provide email notification when these audit events occur.

d. All controller shutdown and startup

e. For privileged user interfaces in MODERATE Impact Systems: All user commands.

3.5.1.3.1.2 Audit Event Information To Record

Configure each controller to record, for each auditable event, the following information (where applicable to the event):

a. what type of event occurred

b. when the event occurred

c. the identity of any individuals or subjects associated with the event

d. For privileged user interfaces in MODERATE Impact Systems: Full text recording of the executed command and the user executing the command.

For MODERATE Impact Systems: Audit records must provide sufficient detail to reconstruct events to determine cause of compromise and magnitude of damage, malfunction, or security violation

3.5.1.3.2 Other Lighting Control System Controllers

There are no requirements to perform auditing at Lighting field controllers that do not FULLY support accounts.

3.5.1.4 Default Requirements for Control System Controllers

For control system controllers where Audit Events, Content of Audit Records, and Audit Generation are not otherwise indicated in this Section:

3.5.1.4.1 Controllers Which FULLY Support Accounts

For each controller which FULLY supports accounts, provide the capability to select audited events and the content of audit logs. Configure controllers to audit the indicated events, and to record the indicated information for each auditable event.

3.5.1.4.1.1 Audited Events

Configure each controller to audit the following events:

a. Successful and unsuccessful attempts to access, modify, or delete privileges, security objects, security levels, or categories of information (e.g. classification levels)

b. Successful and unsuccessful logon attempts

c. Successful logouts

d. Concurrent logons from different workstations

e. All account creations, modifications, disabling, and terminations. For MODERATE Impact Systems, also provide email notification when these audit events occur.

f. All kernel module load, unload, and restart

g. For privileged user interfaces in MODERATE Impact Systems: All user commands.

3.5.1.4.1.2 Audit Event Information To Record

Configure each controller to record, for each auditable event, the following information (where applicable to the event):

a. what type of event occurred

b. when the event occurred

c. where the event occurred

d. the source of the event

e. the outcome of the event

f. the identity of any individuals or subjects associated with the event

g. For privileged user interfaces in MODERATE Impact Systems: Full text recording of the executed command and the user executing the command.

For MODERATE Impact Systems: Audit records must provide sufficient detail to reconstruct events to determine cause of compromise and magnitude of damage, malfunction, or security violation

3.5.1.4.2 Controllers Which Do Not FULLY Support Accounts

For each controller which does not FULLY support accounts configure the controller to audit all controller shutdown and startup events and to record for each event the type of event and when the event occurred.

3.5.2 Audit Time Stamps

{For Government Reference Only: This subpart (and its subparts) relates to AU-8; CCI-000159, CCI-001889, CCI-001890. For MODERATE Impact systems, this subpart (and its subparts) also relates to AU-8 (1); CCI-001891, CCI-001892, CCI-002046.}

Any device (computer or controller) generating audit records must have an internal clock capable of providing time with a resolution of one second. Clocks must not drift more than 10 seconds per day. Configure the system

so that each device (computer or controller) generating audit records maintains accurate time to within 1 second. Note that if the control system specifications include requirement for clocks, the most stringent requirement applies.

3.5.3 Auditing Front End Software

The project site currently has the following software to support control system auditing: none. If there is no existing auditing front end software or the software is not compatible with the provided control systems, provide Auditing Front End Software with audit log import and upload, export, notification, and analysis functionality. The Auditing Front End Software may be provided as a component of the control system front end or as a separate software package, and a single package may serve multiple control systems provided under the same projects if they are sharing a cybersecurity authorization.

When the Auditing Front End Software is neither existing nor installed under the requirements of another Section, furnish the Auditing Front End Software media and license and install the software on the control system front end computer. Submit copies of Auditing Front End Software if this function is not part of the software provided with the control system to meet requirements of other Sections.

3.5.3.1 Import and Upload Requirements

Auditing Front End Software must be capable of importing audit logs from the Device Audit Record Upload Software and of uploading audit logs over the network from all control system devices supporting network upload of audit logs.

3.5.3.2 Export Requirements

Auditing Front End Software must be capable of exporting to a file format supported by Microsoft Excel.

3.5.3.3 Notification Of Audit Failure in Devices in MODERATE Impact Systems

The auditing front end software must be capable of receiving notifications of audit failure from control system devices and computers and be able to provide email notification based on receipt of the notification.

3.5.3.4 Audit Reduction and Report Generation In MODERATE Impact Systems

{For Government Reference Only: This subpart (and its subparts) relates to AU-6(4), AU-7(a), AU-7(b), AU-7(1), AU-12(1); CCI-000154, CCI-001875, CCI-001876, CCI-001877, CCI-001878, CCI-001879, CCI-001880, CCI-001881, CCI-001882, CCI-000158, CCI-000173, CCI-000174, CCI-001577.}

Auditing Front End Software must provide audit reduction and reporting capabilities that supports on-demand review and analysis, on demand reporting, and after the fact investigations of security incidents. The software must be able to combine audit records from all components within the system and analyze them as a single audit record. The software must correct for discrepancies in timestamps of audit logs from different sources and be able to account for discrepancies up to 2 seconds between sources. The software must not alter original audit record content or time ordering of audit records. The software must have the capability to filter audit records using user-defined fields within the audit records.

The audit reduction and reporting capabilities may incorporate third party application, such as Excel or Access.

3.5.4 Audit Storage Capacity and Audit Upload

{For Government Reference Only: This subpart (and its subparts) relates to AU-4; CCI-001848, CCI-001849}

The creation of audit records must never interfere with normal device operation. Devices must cease collection of auditing information if required to maintain normal operation.

a. For devices that have STIG/SRGs related to audit storage capacity (CCI-001848 or CCI-001849) comply with the requirements of those STIG/SRGs.

b. For controllers capable of generating audit records, provide 60 days worth of secure local storage, assuming 10 auditable events per day.

3.5.4.1 Audit Log Storage Notification In MODERATE Impact Systems

{For Government Reference Only: This subpart (and its subparts) relates to AU-5(1); CCI-001855.}

Controllers storing audit logs must provide notification when audit logs reach 75 percent of capacity either directly through email or indirectly by sending a notification to a computer, and the computer sending an email. Computers storing audit logs must provide notification when audit logs reach 75 percent of capacity directly through email.

3.5.4.2 Device Audit Record Upload Software

For each device (computer or controller) required to audit events and for which audit logs cannot be uploaded over the network by the Auditing Front End Software, provide and license to the Government software implementing a secure mechanism of uploading audit records from the device and exporting them to the Auditing Front End Software. Where different devices use different software, provide software of each type required to upload audit logs from all devices.

Submit copies of device audit record upload software if this function is not part of the software provided with the control system to meet requirements of other Sections. If there are no devices requiring this software, provide a document stating this in lieu of this submittal.

3.5.5 Response to Audit Processing Failures

{For Government Reference Only: This subpart (and its subparts) relates to AU-5; CCI-000139, CCI-000140, CCI-001490.}

In the case of a failure in the auditing system, computers associated with auditing must provide email notification to the System Security Officer and the Information Controls Assessor. For MODERATE Impact systems, the computer must also notify the associated auditing front end software. In

case of an audit failure, if possible, continue to collect audit records by overwriting existing audit records.

For MODERATE Impact Systems: In the case of an audit failure at a controller performing auditing, the device must notify the associated auditing front end software of the audit failure if able, and must continue to collect audit records by overwriting existing audit records if able. The auditing front end software must provide notification as indicated, treating the notification of failure from the device as a failure in the auditing system.

3.6 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-000382, CCI-001761, CCI-001762, CCI-002544, CCI-002545, CCI-002546. For MODERATE Impact systems, this subpart (and its subparts) also relates to CM-7(2), CM-7(5)(a), CM-7(5)(b); CCI-000381, CCI-000380, CCI-000382, CCI-001761, CCI-001762}

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.

3.6.1 Device Capabilities

For HVAC Control Systems: Do not provide devices with remote user interfaces or with full user interfaces where one was not required. Do not use a networked sensor or actuator where a non-networked sensor or actuator would suffice.

For Lighting Control Systems: Do not provide devices with remote user interfaces or with full user interfaces where one was not required.

For Other Control Systems: For LOW Impact Systems: Do not provide devices with remote user interfaces or with full user interfaces where one was not required. Do not use a networked sensor or actuator where a non-networked sensor or actuator would suffice.

For Other Control Systems: For MODERATE Impact Systems: Do not provide devices with remote user interfaces or full user interfaces where one was not required. Do not use a networked sensor or actuator where a non-networked sensor or actuator would suffice.

Unless specifically required by the government, do not provide a capability to update device firmware over the network.

3.6.2 Software

For software that has a STIG or SRG related to Requirements for Least Functionality (such as configuration settings and port access for least functionality), install and configure the software in accordance with that STIG or SRG.

For MODERATE Impact Systems: Do not provide (install) software that is not

specifically required to meet a contract requirement. Do not implement functionality within software
that is not specifically required to meet contract requirements.

3.7 SYSTEM AND COMMUNICATION PROTECTION

3.7.1 Collaborative Computing

{For Government Reference Only: This subpart relates to SC-15(a), SC-15(b); CCI-001150, CCI-001152.}

Without explicit approval from the project site, control systems must not use collaborative computing technologies.

3.7.2 Denial of Service Protection and Application Partitioning In MODERATE Impact Systems:

{For Government Reference Only: This subpart relates to SC-5, SC-39, SC-7(a); CCI-001093, CCI-002385, CCI-002386, CCI-002430, CCI-001097. For MODERATE Impact systems, this subpart also relates to SC-2; CCI-001082.}

To the greatest extent practical, implement control logic without reliance on the network. Except when required to meet the requirements of the control system Section (where the requirement can only be met using computer hardware), do not implement control logic in computers. For MODERATE Impact systems, do not implement control logic in a device providing (i.e. acting as a server for) a Full Remote User Interface.

3.7.2.1 Network Reliance in MODERATE Impact HVAC Control Systems

Except for networked input and outputs on input-output buses specifically designed to provide high reliability or redundancy, sensors and actuators must not rely on the network to exchange data with the controller executing the sequence of operation which uses the sensor value or determines the actuator command..

Sensor values required by multiple devices may be shared over the network provided they are connected to a controller requiring the value for execution of the sequence and that controller shares the value on the network.

3.7.2.2 Network Reliance in MODERATE Impact Lighting Control Systems

Except for networked input and outputs on input-output buses specifically designed to provide high reliability or redundancy, sensors and actuators must not rely on the network to exchange data with the controller executing the sequence of operation which uses the sensor value or determines the actuator command.

Sensor values required by multiple devices may be shared over the network provided they are connected to a controller requiring the value for execution of the sequence and that controller shares the value on the network.

3.7.2.3 Default Requirements for MODERATE Impact Control Systems

Except for networked input and outputs on input-output buses specifically designed to provide high reliability or redundancy, sensors and actuators must not rely on the network to exchange data with the controller executing the sequence of operation which uses the sensor value or determines the actuator command.

Sensor values required by multiple devices may be shared over the network provided they are connected to a controller requiring the value for execution of the sequence and that controller shares the value on the network.

3.7.3 Mobile Code In MODERATE Impact Systems:

{For Government Reference Only: This subpart relates to SC-18(a), SC-18(b), SC-18(c), SC-18(1), SC-18(3), SC-18(4); CCI-001160, CCI-001161, CCI-001162, CCI-001163, CCI-001164, CCI-001165, CCI-001166, CCI-001662, CCI-002457, CCI-002458, CCI-001169, CCI-001695, CCI-001170, CCI-002469}

Devices with STIGs/SRGs related to Mobile Code and to Security Control SC-18 must be installed in accordance with the relevant STIGs/SRGs. All remote user interfaces must meet the requirements of the "Web Browsers and Application SRG".

Mobile code may only be downloaded from a specifically authorized mobile code repository. Coordinate with the Mobile Code Point of Contact for the location of a repository.

3.7.4 Protection of Information at Rest In MODERATE Impact Systems:

{For Government Reference Only: This subpart relates to SC-28, SC-28(1); CCI-001199,
CCI-002472, CCI-002475, CCI-002476}

Computers must protect information at rest in accordance with applicable STIGs.

Any control system device storing personally identifiable information (PII), controlled unclassified information (CUI), or classified information must be protected by an Information At Rest encryption solution or by a physical security solution. Provide a Protection of Information At Rest Proposal indicating each device storing PII, CUI, or classified information and the encryption or physical security solution proposed for that device for government approval. If no devices stores PII, CUI, or classified information, provide a document stating this as the Protection of Information At Rest Proposal submittal. Do proceed with device selection and installation until the Protection of Information At Rest Proposal is approved. Once approved, implement approved Information At Rest protections.

3.7.5 Process Isolation and Boundary Protection in Moderate Impact Fire Protection Systems

{For Government Reference Only: This subpart relates to SC-7(a), SC-7(c), SC-7(4)(a), SC-7(4)(c), SC-7(5), SC-7(7), SC-7(9)(a), SC-7(11), SC-7(13), SC-7(13), SC-7(18); CCI-001097, CCI-001098, CCI-001102, CCI-002396, CCI-001109, CCI-002397, CCI-002398, CCI-002399, CCI-002403, CCI-001120, CCI-001119, CCI-001126}

3.7.5.1 Radio Interfaces for Fire Protection Systems

When radios interfacing a local fire protection system to a supervisory system are not NIST FIPS 140-2 validated, use a relay panel interface between the local fire protection system and the radio. Install and configure the relay panel to prohibit initiating any action within the local fire protection system other than causing the system to play a pre-recorded message or causing the system to play a live audio message. Install relays using the normally open contact such that they pass a signal when they close, and so that a relay that loses power or has a failed coil does not pass a signal

3.7.5.2 Fire Suppression System Network Isolation

For fire suppression systems including a release panel, any network used in these systems must be dedicated to these systems and must be isolated from any other network, including other components of the Fire Alarm and Fire Suppression systems. Use only dry contacts and relays to transfer signals from these systems to any other systems. Install relays using the normally open contact such that they pass a signal when they close, and so that a relay that loses power or has a failed coil does not pass a signal

3.8 SAFE MODE AND FAIL SAFE OPERATION

{For Government Reference Only: This subpart (and its subparts) relates to CP-12, SI-10(3), SI-17; CCI-002855, CCI-002856, CCI-002857, CCI-002754, CCI-002773, CCI-002774, CCI-002775}

For all control system components with an applicable STIG or SRG, configure the component in accordance with all applicable STIGs and SRGs.

3.9 SYSTEM MAINTENANCE TOOL SOFTWARE

{For Government Reference Only: This subpart (and its subparts) relates to MA-3; CCI-000865.}

Submit and license to the Government all software required to operate, maintain and modify the control system such the Government or their agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor, Vendor or Manufacturer. Submit hard copies of user manuals for each software with the software submittal.

For software provided and licensed to the Government under the requirements of another Section, submit a statement indicating the Section and Submittal under which the software was provided. For software provided to meet the requirements of this Section and not provided and licensed under another Section, submit software and software user manuals on DVD or CD as a Technical Data Package and submit one hard copy of the software user manual for each piece of software.

3.10 DEVICE POWER

{For Government Reference Only: This subpart (and its subparts) relates

to PE-11, PE-11(1); CCI-002955, CCI-000961. For MODERATE Impact systems, this subpart (and its subparts) also relates to PE-9, PE-9(1); CCI-000952, CCI-002953, CCI-002954.}

For MODERATE Impact Systems: Provide control system with power supply meeting or exceeding the reliability of the controlled equipment. Powering control system devices using the same power source as the equipment controlled by the device is a permissible method of meeting this requirement. Without explicit approval from the government, do not install local uninterruptible power supplies (UPSs) as a source of device power.

3.10.1 Device Behavior on Loss of Power In MODERATE Impact Systems:

Application programs and configuration settings must be stored in devices in manner such that a loss of power does not result in a loss of the application program or configuration settings: Loss of power must never result in the loss of application programs, regardless of the length of time power is lost; and loss of power for less than 2,500 hours must not result in the loss of configured settings.

In the event of a loss of power, when power is restored, controllers and computers executing control logic (and the underlying equipment) must recover and resume their normal sequences of operation. Note that the sequence of operation may require specific actions (e.g. startup sequences) upon recovery from loss of power.

3.11 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. For MODERATE Impact systems, this subpart (and its subparts) also relates to RA-5(1), RA-5(5); CCI-001062, CCI-001067, CCI-001645, CCI-002906.}

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.

3.11.1 Computers and Software Running on Computers

Computers and applications running on computers must meet relevant vulnerability scanning STIGs/SRGs and respond to approved DoD vulnerability scanning tools.

3.11.2 Controllers

Provide controllers that are 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 must contain sufficient detail to detect vulnerabilities or exploits of the controller.

Provide all software needed to scan the control system as the Control System Scanning Tools submittal. If the software required to scan the system is already installed at the project site or is provided under a separate section instead provide a statement indicating this.

3.12 FIPS 201-2 REQUIREMENT

{For Government Reference Only: This subpart (and its subparts) relates to SA-4 (10); CCI-003116}

Devices in the following systems which implement PIV must be on the NIST FIPS 201-2 approved product list (https://www.idmanagement.gov/approved-products-list/): NONE.

3.13 SYSTEM AND INTEGRATION INTEGRITY

3.13.1 Malicious Code Protection

{For Government Reference Only: This subpart (and its subparts) relates to SI-3(c); CCI-001241, CCI-002623}

For all computers installed under this project, provide malware protection software media, provide licenses, and install and configure malware protection software as indicated. Coordinate with the Government Computer Access Point of Contact as required.

a. Provide malware protection software licenses.

b. Provide malware protection software media.

c. Install and configure malware protection software in accordance with the relevant STIGs.

3.13.2 Software, Firmware, and Information Integrity In MODERATE Impact Systems:

If there exists Integrity Verification Software that can check software, firmware, or information in the control system and verify its integrity, provide it. If no such software exists provide a statement to this affect in lieu of the software.

3.14 CONTROL SYSTEM CYBERSECURITY TESTING

{For Government Reference Only: For MODERATE Impact systems, this subpart (and its subparts) relates to SA-11(a), SA-11(b), SA-11(c), SA-11(d), SA-11(e); CCI-003171, CCI-003172, CCI-003173, CCI-003174, CCI-003175, CCI-003176, CCI-003177, CCI-003178.}

3.14.1 Control System Cybersecurity Testing Procedures

Prepare Control System Cybersecurity Testing Procedures explaining step-by-step, the actions and expected results that will demonstrate that the control system meets the requirements of this Section.

Submit 4 copies of the Control System Cybersecurity Testing Procedures. The Control System Cybersecurity Testing Procedures may be submitted as a Technical Data Package.

3.14.2 Control System Cybersecurity Testing Execution

Using the Control System Cybersecurity Testing Procedures verify that the control system meets the requirements of this Section. UNLESS GOVERNMENT

WITNESSING OF A TEST IS SPECIFICALLY WAIVED BY THE GOVERNMENT, PERFORM ALL TESTS WITH A GOVERNMENT WITNESS. If testing reveals deficiencies in the system, correct the deficiency and retest until successful.

3.14.3 Control System Cybersecurity Testing Report

Prepare and submit a Control System Cybersecurity Testing Report documenting all tests performed and their results. Include all tests in the Control System Cybersecurity Testing Procedures and any additional tests performed during testing. Document test failures and repairs conducted with the test results.

Submit four copies of the Control System Cybersecurity Testing Report. The Control System Cybersecurity Testing Report may be submitted as a Technical Data Package.

3.15 FIELD QUALITY CONTROL, CYBERSECURITY VALIDATION SUPPORT

In addition to testing and testing support required by other Sections, provide technical support for cybersecurity testing of control systems to support the DoD Risk Management Framework process Cybersecurity assessment of the control system. This support is independent of (and in addition to) the Control System Cybersecurity Testing specified in this section.

3.16 CYBERSECURITY TRAINING

Provide eight hours of classroom and hands-on training for six Government personnel on the cybersecurity operation and maintenance of the control system provided. This training is in addition to and must be coordinated with control system training specified in other Sections.

The Government will provide the training location. Training must cover, at a minimum: (a) applying software and firmware updates, (b) user account creation, modification and deletion, (c) audit log upload procedures and (d) identification of privileged user interfaces and system impact of those interfaces. Training session must include a question and answer period during which government staff questions about cybersecurity aspects of the control system are answered.

-- End of Section --

SECTION 26 20 00

INTERIOR DISTRIBUTION SYSTEM
08/19, CHG 3: 11/21

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.

ASTM INTERNATIONAL (ASTM)

ASTM B1	(2013) Standard Specification for Hard-Drawn Copper Wire
ASTM B8	(2011; R 2017) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D709	(2017) Standard Specification for Laminated Thermosetting Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 81	(2012) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2023) National Electrical Safety Code

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2021) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA NEIS 1	(2015) Standard for Good Workmanship in Electrical Construction

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2020) American National Standard for Electrical Rigid Steel Conduit (ERSC)
ANSI C80.3	(2020) American National Standard for Electrical Metallic Tubing (EMT)
ANSI C80.5	(2020) American National Standard for Electrical Rigid Aluminum Conduit

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA FU 1	(2012) Low Voltage Cartridge Fuses
NEMA ICS 1	(2022) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA KS 1	(2013) Enclosed and Miscellaneous Distribution Equipment Switches (600 V Maximum)
NEMA RN 1	(2005; R 2013) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA ST 20	(2014) Dry-Type Transformers for General Applications
NEMA TC 2	(2020) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2021) Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit and Tubing
NEMA VE 1	(2017) Metal Cable Tray Systems
NEMA WD 1	(1999; R 2020) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2016) Wiring Devices Dimensions Specifications
NEMA Z535.4	(2011; R 2017) Product Safety Signs and Labels

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 70E	(2024) Standard for Electrical Safety in the Workplace
NFPA 780	(2020) Standard for the Installation of Lightning Protection Systems

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568.1	(2020e) Commercial Building Telecommunications Infrastructure Standard
TIA-569	(2019e) Telecommunications Pathways and Spaces
TIA-607	(2019d) Generic Telecommunications Bonding

	and Grounding (Earthing) for Customer Premises

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 431	Energy Efficiency Program for Certain Commercial and Industrial Equipment
29 CFR 1910.147	The Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1910.303	Electrical, General

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005; Reprint Jan 2020) UL Standard for Safety Flexible Metal Conduit
UL 6	(2007; Reprint Sep 2019) UL Standard for Safety Electrical Rigid Metal Conduit-Steel
UL 6A	(2008; Reprint Mar 2021) UL Standard for Safety Electrical Rigid Metal Conduit - Aluminum, Red Brass, and Stainless Steel
UL 20	(2018; Reprint Jan 2021) UL Standard for Safety General-Use Snap Switches
UL 50	(2015) UL Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations
UL 67	(2018; Reprint Jul 2020) UL Standard for Safety Panelboards
UL 83	(2017; Reprint Mar 2020) UL Standard for Safety Thermoplastic-Insulated Wires and Cables
UL 248-4	(2010; Reprint Apr 2019) Low-Voltage Fuses - Part 4: Class CC Fuses
UL 248-8	(2011; Reprint Aug 2020) Low-Voltage Fuses - Part 8: Class J Fuses
UL 248-10	(2011; Reprint Aug 2020) Low-Voltage Fuses - Part 10: Class L Fuses
UL 248-12	(2011; Reprint Aug 2020) Low Voltage Fuses - Part 12: Class R Fuses
UL 248-15	(2018) Low-Voltage Fuses - Part 15: Class T Fuses
UL 360	(2013; Reprint Aug 2021) UL Standard for Safety Liquid-Tight Flexible Metal Conduit
UL 467	(2022) UL Standard for Safety Grounding and Bonding Equipment

UL 486A-486B	(2018; Reprint May 2021) UL Standard for Safety Wire Connectors
UL 486C	(2018; Reprint May 2021) UL Standard for Safety Splicing Wire Connectors
UL 489	(2016; Rev 2019) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 498	(2017; Reprint Sep 2021) UL Standard for Safety Attachment Plugs and Receptacles
UL 510	(2020) UL Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514A	(2013; Reprint Aug 2017) UL Standard for Safety Metallic Outlet Boxes
UL 514B	(2012; Reprint May 2020) Conduit, Tubing and Cable Fittings
UL 514C	(2014; Reprint Feb 2020) UL Standard for Safety Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 651	(2011; Reprint Mar 2020) UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 674	(2011; Reprint Dec 2020) UL Standard for Safety Electric Motors and Generators for Use in Hazardous (Classified) Locations
UL 797	(2007; Reprint Mar 2021) UL Standard for Safety Electrical Metallic Tubing -- Steel
UL 854	(2020) Standard for Service-Entrance Cables
UL 869A	(2006; Reprint Jun 2020) Reference Standard for Service Equipment
UL 943	(2016; Reprint Feb 2018) UL Standard for Safety Ground-Fault Circuit-Interrupters
UL 1203	(2013; Reprint Mar 2021) UL Standard for Safety Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
UL 1242	(2006; Reprint Aug 2020) Standard for Electrical Intermediate Metal Conduit -- Steel
UL 1449	(2021) UL Standard for Safety Surge Protective Devices

UL 1569	(2018) UL Standard for Safety Metal-Clad Cables
UL 1660	(2019) Liquid-Tight Flexible Nonmetallic Conduit
UL 4248-1	(2017) UL Standard for Safety Fuseholders - Part 1: General Requirements
UL 4248-12	(2018) UL Standard for Safety Fuseholders - Part 12: Class R

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 100.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Panelboards

Transformers

SD-03 Product Data

Receptacles

Circuit Breakers

Switches

Transformers

Enclosed Circuit Breakers

Manual Motor Starters

Surge Protective Devices

Cable TraysSD-06 Test Reports

600-volt Wiring Test

Grounding System Test

Transformer Tests

Ground-fault Receptacle Test

SD-07 Certificates

Fuses

SD-09 Manufacturer's Field Reports

Transformer Factory Tests

SD-10 Operation and Maintenance Data

Electrical Systems, Data Package 5

1.4 QUALITY ASSURANCE

1.4.1 Fuses

Submit coordination data as specified in paragraph, FUSES of this section.

1.4.2 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. Provide equipment, materials, installation, and workmanship in accordance with NFPA 70 unless more stringent requirements are specified or indicated. NECA NEIS 1 shall be considered the minimum standard for workmanship.

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 Electrical Systems

Submit operation and maintenance data in accordance with Section 01 78 23, OPERATION AND MAINTENANCE DATA and as specified herein. 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, where UL standards are established for those items, and requirements of NFPA 70 for all materials, equipment, and devices.

2.2 CONDUIT AND FITTINGS

Conform to the following:

2.2.1 Rigid Metallic Conduit

2.2.1.1 Rigid, Threaded Zinc-Coated Steel Conduit

ANSI C80.1, UL 6.

2.2.1.2 Rigid Aluminum Conduit

ANSI C80.5, UL 6A.

2.2.2 Rigid Nonmetallic Conduit

PVC Type EPC-40, and EPC-80 in accordance with NEMA TC 2,UL 651.

2.2.3 Intermediate Metal Conduit (IMC)

UL 1242, zinc-coated steel only.

2.2.4 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, ANSI C80.3.

2.2.5 Plastic-Coated Rigid Steel and IMC Conduit

NEMA RN 1, Type 40(40 mils thick).

2.2.6 Flexible Metal Conduit

UL 1, limited to 6 feet.

2.2.6.1 Liquid-Tight Flexible Metal Conduit, Steel

UL 360, limited to 6 feet.

2.2.7 Fittings for Metal Conduit, EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings: cadmium- or zinc-coated in accordance with UL 514B.

2.2.7.1 Fittings for Rigid Metal Conduit and IMC

Threaded-type. Split couplings unacceptable.

2.2.7.2 Fittings for EMT

Steel compression type.

2.2.8 Fittings for Rigid Nonmetallic Conduit

NEMA TC 3 for PVC, and UL 514B.

2.2.9 Liquid-Tight Flexible Nonmetallic Conduit

UL 1660.

2.3 CABLE TRAYS

NEMA VE 1. Provide the following:

a. Cable trays: form a wireway system, with a nominal depth as indicated.

b. Cable trays: constructed of aluminum.

c. Cable trays: include splice and end plates, dropouts, and miscellaneous hardware.

d. Edges, fittings, and hardware: finished free from burrs and sharp edges.

e. Fittings: ensure not less than load-carrying ability of straight tray sections and have manufacturer's minimum standard radius.

f. Radius of bends: as indicated.

2.3.1 Basket-Type Cable Trays

Provide size as indicated with maximum wire mesh spacing of 2 by 4 inch.

2.4 OUTLET BOXES AND COVERS

UL 514A, cadmium- or zinc-coated, if ferrous metal. UL 514C, if

nonmetallic.

2.4.1 Outlet Boxes for Telecommunications System

Provide the following:

a. Standard type 4 11/16 inches square by 2 1/8 inches deep.

b. Outlet boxes for wall-mounted telecommunications outlets: 4 by 2 1/8 by 2 1/8 inches deep.

c. Depth of boxes: large enough to allow manufacturers' recommended conductor bend radii.

2.5 CABINETS, JUNCTION BOXES, AND PULL BOXES

UL 50; volume greater than 100 cubic inches, NEMA Type 1 enclosure; sheet steel, hot-dip, zinc-coated. Where exposed to wet, damp, or corrosive environments, NEMA Type 3Ras indicated.

2.6 WIRES AND CABLES

Provide wires and cables in accordance applicable requirements of NFPA 70 and UL 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.

2.6.1 Conductors

Provide the following:

a. Conductor sizes and capacities shown are based on copper, unless indicated otherwise.

b. Conductors No. 8 AWG and larger diameter: stranded.

c. Conductors No. 10 AWG 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.Conductors indicated to be No. 6 AWG or smaller diameter: copper. Conductors indicated to be No. 4 AWG and larger diameter: either copper or aluminum, unless type of conductor material is specifically indicated, or specified, or required by equipment manufacturer.

2.6.1.1 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.

2.6.1.2 Minimum Conductor Sizes

Provide minimum conductor size in accordance with the following:

a. Branch circuits: No. 12 AWG.

b. Class 1 remote-control and signal circuits: No. 14 AWG.

c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.

d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.

e. Digital low voltage lighting control (DLVLC) system at 24 Volts or less: Category 5 UTP cables in EMT conduit.

2.6.2 Color Coding

Provide color coding for service, feeder, branch, control, and signaling circuit conductors.

2.6.2.1 Ground and Neutral Conductors

Provide color coding of ground and neutral conductors as follows:

a. Grounding conductors: Green.

b. Neutral conductors: White.

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.

2.6.2.2 Ungrounded Conductors

Provide color coding of ungrounded conductors in different voltage systems as follows:

a. 208/120 volt, three-phase

(1) Phase A - black

(2) Phase B - red

(3) Phase C - blue

b. 480/277 volt, three-phase

(1) Phase A - brown

(2) Phase B - orange

(3) Phase C - yellow

c. 120/240 volt, single phase: Black and red

2.6.3 Insulation

Unless specified or indicated otherwise or required by NFPA 70, provide power and lighting wires rated for 600-volts, Type THWN/THHN conforming to UL 83, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits: Type TW or TF, conforming to UL 83. Where equipment or devices require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.6.4 Bonding Conductors

ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.6.4.1 Telecommunications Bonding Backbone (TBB)

Provide a copper conductor TBB in accordance with TIA-607 with No. 6 AWG minimum size, and sized at 2 kcmil per linear foot of conductor length up to a maximum size of 750 kcmil. Provide insulated TBB with insulation as specified in the paragraph INSULATION and meeting the fire ratings of its pathway.

2.6.4.2 Bonding Conductor for Telecommunications

Provide a copper conductor Bonding Conductor for Telecommunications between the telecommunications main grounding busbar (PBB) and the electrical service ground in accordance with TIA-607. Size the bonding conductor for telecommunications the same as the TBB.

2.6.5 Service Entrance Cables

Service Entrance (SE) and Underground Service Entrance (USE) Cables, UL 854.

2.6.6 Metal-Clad Cable

UL 1569; NFPA 70, Type MC cable.

2.7 SPLICES AND TERMINATION COMPONENTS

UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires: insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.8 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 0.03 inch 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."

2.9 SWITCHES

2.9.1 Toggle Switches

NEMA WD 1, UL 20, single pole, three-way, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw. 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, 120/277 volts, with current rating and number of poles indicated.

2.9.2 Disconnect Switches

NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Utilize Class R fuseholders and fuses for fused switches, unless indicated otherwise. Provide horsepower rated for switches serving as the motor-disconnect means. Provide switches in NEMA 1 3R , enclosure as indicated per NEMA ICS 6.

2.10 FUSES

NEMA FU 1. Provide complete set of fuses for each fusible switch. Coordinate time-current characteristics curves of fuses serving motors or connected in series with circuit breakers or other circuit protective devices for proper operation. Submit coordination data for approval. Provide fuses with a voltage rating not less than circuit voltage.

2.10.1 Fuseholders

Provide in accordance with UL 4248-1.

2.10.2 Cartridge Fuses, Current Limiting Type (Class R)

UL 248-12, Class RK-1 RK-5. Provide only Class R associated fuseholders in accordance with UL 4248-12.

2.10.3 Cartridge Fuses, High-Interrupting Capacity, Current Limiting Type (Classes J, L, and CC)

UL 248-8, UL 248-10, UL 248-4, Class J for zero to 600 amperes, Class L for 601 to 6,000 amperes, and Class CC for zero to 30 amperes.

2.10.4 Cartridge Fuses, Current Limiting Type (Class T)

UL 248-15, Class T for zero to 1,200 amperes, 300 volts; and zero to 800 amperes, 600 volts.

2.11 RECEPTACLES

Provide the following:

a. UL 498, general purpose specification grade, grounding-type. Residential grade receptacles are not acceptable.

b. Ratings and configurations: as indicated.

c. Bodies: white as per NEMA WD 1.

d. Face and body: thermoplastic supported on a metal mounting strap.

e. Dimensional requirements: per NEMA WD 6.

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.

2.11.1 Split Duplex Receptacles

Provide separate terminals for each ungrounded pole. One receptacle must be controlled separately.

2.11.2 Weatherproof Receptacles

Provide receptacles, UL listed for use in "wet locations" with integral GFCI protection. Include cast metal box with gasketed, hinged, lockable and weatherproof while-in-use, polycarbonate, UV resistant/stabilized cover plate.

2.11.3 Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Provide device capable of detecting current leak when the current to ground is 6 milliamperes or higher, and tripping per requirements of UL 943 for Class A ground-fault circuit interrupter devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.11.4 Special Purpose Receptacles

Receptacles serving equipment are special purpose. Provide in ratings indicated.

2.12 PANELBOARDS

Provide panelboards in accordance with the following:

a. UL 67 and UL 50 having a short-circuit current rating as indicated .

b. Panelboards for use as service disconnecting means: additionally conform to UL 869A.

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 design drawings. If it is not possible to match "specific breaker placement" during construction, obtain Government approval prior to device installation.

f. Use of "Subfeed Breakers" is not acceptable.

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).

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.

a. UL 67 and UL 50.

b. Panelboards for use as service disconnecting: additionally conform to UL 869A.

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. Where "space only" is indicated, make provisions for future installation of breaker sized as indicated.

f. Directories: indicate load served by each circuit of panelboard.

g. Directories: indicate source of service (e.g. upstream panel, switchboard, motor control center) to panelboard.

h. Type directories and mount in holder behind transparent protective covering.

i. Panelboard nameplates: provided in accordance with paragraph FIELD FABRICATED NAMEPLATES.

2.12.1 Enclosure

Provide panelboard enclosure in accordance with the following:

a. UL 50.

b. Cabinets mounted outdoors or flush-mounted: hot-dipped galvanized after fabrication .

c. Cabinets: painted in accordance with paragraph PAINTING.

d. Outdoor cabinets: NEMA 3R raintight with conduit hubs welded to the cabinet.

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 1/8 inch.

g. Holes: provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a 1/2 inch 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 latch.

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.

2.12.2 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 UL 67 for connecting grounding conductors; bond to steel cabinet.

2.12.3 Circuit Breakers

UL 489, thermal magnetic-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. Series rated circuit breakers and plug-in circuit breakers are unacceptable.

2.12.3.1 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.

2.12.3.2 Circuit Breaker With Ground-Fault Circuit Interrupter

UL 943 and NFPA 70. Provide with auto-monitoring (self-test) and lockout features, "push-to-test" button, visible indication of tripped condition, and ability to detect and trip when current imbalance is 6 milliamperes or higher per requirements of UL 943 for Class A ground-fault circuit interrupter devices.

2.13 ENCLOSED CIRCUIT BREAKERS

UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated.

2.14 TRANSFORMERS

Provide transformers in accordance with the following:

a. NEMA ST 20, general purpose, dry-type, self-cooled, ventilated.

b. Provide transformers in NEMA 1 3R enclosure.

c. Taps for transformers 15 kVA and larger: Two 2.5 percent taps Full Capacity Above Nominal (FCAN) and four 2.5 percent taps Full Capacity Below Nominal (FCBN) .

d. Transformer insulation system:

(1) 220 degrees C insulation system for transformers 15 kVA and greater, with temperature rise not exceeding 115 degrees C under full-rated load in maximum ambient of 40 degrees C.

(2) 180 degrees C insulation for transformers rated 10 kVA and less, with temperature rise not exceeding 80 degrees C under full-rated load in maximum ambient of 40 degrees C.

2.14.1 Specified Transformer Efficiency

Transformers, indicated and specified with: 480V primary, 80 degrees C or 115 degrees C temperature rise, kVA ratings of 37.5 to 100 for single phase or 30 to 500 for three phase, energy efficient type. The transformer is not acceptable if the calculated transformer efficiency is less than the efficiency indicated in 10 CFR 431, Subpart K.

2.15 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single pole designed for surface mounting with overload protection.

2.16 LOCKOUT REQUIREMENTS

Provide circuit breakers, disconnecting means, and other devices that are electrical energy-isolating capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147, NFPA 70E and 29 CFR 1910.303. Comply with requirements of Division 23, "Mechanical" for mechanical isolation of machines and other equipment.

2.17 TELECOMMUNICATIONS SYSTEM

Provide system of telecommunications wire-supporting structures (pathway), including: outlet boxes, conduits with pull wires and other accessories for telecommunications outlets and pathway in accordance with TIA-569 and as specified herein. Non-continuous cable support will not be used for cabling support. Additional telecommunications requirements are specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

2.18 GROUNDING AND BONDING EQUIPMENT

2.18.1 Ground Rods

UL 467. Ground rods: cone pointed copper-clad steel, with minimum diameter of 3/4 inch and minimum length 10 feet. Sectional type rods may be used for rods 20 feet or longer.

2.19 HAZARDOUS LOCATIONS

Electrical materials, equipment, and devices for installation in hazardous locations, as defined by NFPA 70: specifically approved by Underwriters' Laboratories, Inc., or Factory Mutual for particular "Class," "Division," and "Group" of hazardous locations involved. Boundaries and classifications of hazardous locations: as indicated. Equipment in hazardous locations: comply with UL 1203 for electrical equipment and industrial controls and UL 674 for motors.

2.20 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.

2.21 FIELD FABRICATED NAMEPLATES

Provide field fabricated nameplates in accordance with the following:

a. ASTM D709.

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, 0.125 inch thick, white with black center core.

f. Surface: matte finish. Corners: square. Accurately align lettering and engrave into the core.

g. Minimum size of nameplates: one by 2.5 inches.

h. Lettering size and style: a minimum of 0.25 inch high normal block style.

2.22 WARNING SIGNS

Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards, industrial control panels, and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. Provide marking that is clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.23 FIRESTOPPING MATERIALS

Provide firestopping around electrical penetrations in accordance with Section 07 84 00.00 22 FIRESTOPPING.

2.24 SURGE PROTECTIVE DEVICES

Provide parallel type surge protective devices (SPD) which comply with UL 1449 at the service entrance . Provide surge protectors in a NEMA 1 enclosure per NEMA ICS 6. SPD must have the same short-circuit current rating as the protected equipment and must not be installed at a point of system where the available fault current is in excess of that rating. Use Type 1 or Type 2 SPD and connect on the load side of a dedicated circuit breaker. Submit performance and characteristic curves.

Provide the following modes of protection:

FOR SINGLE PHASE AND THREE PHASE WYE CONNECTED SYSTEMS-
Phase to phase (L-L)
Each phase to neutral (L-N)
Neutral to ground (N-G)
Phase to ground (L-G)

SPDs at the service entrance: provide with a minimum surge current rating of 80,000 amperes for L-L mode minimum and 40,000 amperes for other modes (L-N, L-G, and N-G).

Provide SPDs per NFPA 780 for the lightning protection system.

Maximum L-N, and N-G Voltage Protection Rating:

1,200V for 480Y/277V, three phase system

Maximum L-G Protection Rating:

1,200V for 480Y/277V, three phase system

Maximum L-L Voltage Protection Rating:

1,800V for 480Y/277V, three phase system

The minimum MCOV (Maximum Continuous Operating Voltage) rating for L-N and L-G modes of operation: 120 percent of nominal voltage for 240 volts and

below; 115 percent of nominal voltage above 240 volts to 480 volts.

2.25 FACTORY APPLIED FINISH

Provide factory-applied finish on electrical equipment in accordance with the following:

a. NEMA 250 corrosion-resistance test and the additional requirements as specified herein.

b. Interior and exterior steel surfaces of equipment enclosures: thoroughly cleaned followed by a rust-inhibitive phosphatizing or equivalent treatment prior to painting.

c. Exterior surfaces: free from holes, seams, dents, weld marks, loose scale or other imperfections.

d. Interior surfaces: receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice.

e. Exterior surfaces: primed, filled where necessary, and given not less than two coats baked enamel with semigloss finish.

f. Equipment located indoors: ANSI Light Gray, and equipment located outdoors: ANSI Light Gray.

g. Provide manufacturer's coatings for touch-up work and as specified in paragraph FIELD APPLIED PAINTING.

2.26 SOURCE QUALITY CONTROL

2.26.1 Transformer Factory Tests

Submittal: include routine NEMA ST 20 transformer test results on each transformer and also provide the results of NEMA "design" and "prototype" tests that were made on transformers electrically and mechanically equal to those specified.

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 NFPA 70 and IEEE C2 and to requirements specified herein.

3.1.1 Underground Service

Underground service conductors and associated conduit: continuous from service entrance equipment to outdoor power system connection.

3.1.2 Hazardous Locations

Perform work in hazardous locations, as defined by NFPA 70, in strict accordance with NFPA 70 for particular "Class," "Division," and "Group" of hazardous locations involved. Provide conduit and cable seals where required by NFPA 70. Provide conduit with tapered threads.

3.1.3 Service Entrance Identification

Service entrance disconnect devices, switches, and enclosures: labeled and identified as such.

3.1.3.1 Labels

Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, 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 0.25 inch in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure: provided only as permitted by NFPA 70.

3.1.4 Wiring Methods

Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 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: 1/2 inch 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 6 inches. Firestop conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors in accordance with Section 07 84 00.00 22 FIRESTOPPING.

3.1.4.1 Pull Wire

Install pull wires in empty conduits. Pull wire: plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3.1.4.2 Metal-Clad Cable

Install in accordance with NFPA 70, Type MC cable.

3.1.5 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches 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.

3.1.5.1 Restrictions Applicable to EMT

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 physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.

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).

3.1.5.2 Restrictions Applicable to Nonmetallic Conduit

a. PVC Schedule 40.

(1) Do not use where subject to physical damage, including but not limited to, mechanical equipment rooms, electrical equipment rooms, fire pump rooms, and where restrictions are applying to both PVC Schedule 40 and PVC Schedule 80.

(2) Do not use above grade, except where allowed in this section for rising through floor slab or indicated otherwise.

b. PVC Schedule 40 and Schedule 80.

(1) Do not use where subject to physical damage, including but not limited to, hospitals, power plant, missile magazines, and other such areas.

(2) Do not use in hazardous (classified) areas.

(3) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

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3.1.5.3 Restrictions Applicable to Flexible Conduit

Use only as specified in paragraph FLEXIBLE CONNECTIONS. Do not use when the enclosed conductors must be shielded from the effects of High-altitude Electromagnetic Pulse (HEMP).

3.1.5.4 Underground Conduit

Plastic-coated rigid steel; plastic-coated steel IMC; PVC, Type EPC-40; or fiberglass. Convert nonmetallic conduit, other than PVC Schedule 40 or 80, to plastic-coated rigid, or IMC, steel conduit before rising through floor slab. Plastic coating: extend minimum 6 inches above floor.

3.1.5.5 Conduit Installed Under Floor Slabs

Conduit run under floor slab: located a minimum of 12 inches below the vapor barrier. Seal around conduits at penetrations thru vapor barrier. Use NECA NEIS 1 Table 2a (Minimum Raceway Spacing) to determine under floor slab conduit spacing unless greater spacing is required elsewhere in this section.

3.1.5.6 Conduit Through Floor Slabs

Where conduits rise through floor slabs, do not allow curved portion of bends to be visible above finished slab. Where conduit rises through slab-on grade, seal all electrical penetrations to address radon mitigation and prevent infiltration of air, insects, and vermin.

3.1.5.7 Conduit Installed in Concrete Floor Slabs

Rigid steel; steel IMC; fiberglass, or PVC, Type EPC-40.Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Do not stack conduits. Space conduits horizontally not closer than three diameters, except at cabinet locations. Curved portions of bends must not be visible above finish slab. Increase slab thickness as necessary to provide minimum one inch cover over conduit. Where embedded conduits cross building expansion joints, provide suitable watertight expansion/deflection fittings and bonding jumpers. Expansion/deflection fittings must allow horizontal and vertical movement of raceway. Conduit larger than one inch trade size: installed parallel with or at right angles to main reinforcement; when at right angles to reinforcement, install conduit close to one of supports of slab. Where nonmetallic conduit is used, convert raceway to plastic coated rigid steel or plastic coated steel IMC before rising above floor, unless specifically indicated.

3.1.5.8 Stub-Ups

Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

3.1.5.9 Conduit Support

Support conduit by pipe straps, wall brackets, threaded rod conduit hangers, or ceiling trapeze. Plastic cable ties are not acceptable. 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 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch 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. Conduit and box systems: supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Do not share supporting means between electrical raceways and mechanical piping or ducts. Coordinate installation with 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. 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 2 1/2 inches 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.

3.1.5.10 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.

3.1.5.11 Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, 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 by NFPA 70.

3.1.5.12 Flexible Connections

Provide flexible steel conduit between 3 and 6 feet 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: 1/2 inch diameter. Provide liquid tight flexible nonmetallic conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections. Plastic cable ties are not acceptable as a support method.

3.1.5.13 Telecommunications and Signal System Pathway

Install telecommunications pathway in accordance with TIA-569.

a. Horizontal Pathway: Telecommunications pathways from the work area to the telecommunications room: installed and cabling length requirements in accordance with TIA-568.1. Size conduits in accordance with TIA-569 and as indicated.

b. Backbone Pathway: Telecommunication pathways from the telecommunications entrance facility to telecommunications rooms, and, telecommunications equipment rooms (backbone cabling): installed in accordance with TIA-569. Size conduits for telecommunications risers in accordance with TIA-569 and as indicated.

3.1.6 Busway Installation

Comply at minimum with NFPA 70. Install busways parallel with or at right angles to ceilings, walls, and structural members. Support busways at 5 foot maximum intervals, and brace to prevent lateral movement. Provide fixed type hinges on risers; spring-type are unacceptable. Provide flanges where busway makes penetrations through walls and floors, and seal to maintain smoke and fire ratings. Provide waterproof curb where busway riser passes through floor. Seal gaps with fire-rated foam and caulk. Provide expansion joints, but only where bus duct crosses building

expansion joints. 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.

3.1.7 Cable Tray Installation

Install and ground in accordance with NFPA 70. In addition, install and ground telecommunications cable tray in accordance with TIA-569, and TIA-607. Install cable trays parallel with or at right angles to ceilings, walls, and structural members. Cable tray and tray supports must not partially nor completely obstruct access to the room. Support in accordance with manufacturer recommendations but at not more than 6 foot intervals. Coat contact surfaces of aluminum connections with an antioxidant compound prior to assembly. Adjacent cable tray sections: bonded together by connector plates of an identical type as the cable tray sections. For grounding of cable tray system provide No. 2 AWG bare copper wire throughout cable tray system, and bond to each section, except use No. 1/0 aluminum wire if cable tray is aluminum. Terminate cable trays 10 inches from both sides of smoke and fire partitions. Install conductors run through smoke and fire partitions in 4 inch rigid steel conduits with grounding bushings, extending 12 inches beyond each side of partitions. Seal conduit on both ends to maintain smoke and fire ratings of partitions. Firestop penetrations in accordance with Section 07 84 00.00 22, FIRESTOPPING. 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.

3.1.8 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 7 feet above floors and walkways, or when installed in hazardous areas 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 conduit system. Provide each box with volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures: minimum 4 inches 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 fixtures for 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 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

3.1.8.1 Boxes

Boxes for use with raceway systems: minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets: minimum 4 inches square, except that 4 by 2 inch boxes may be used where only one raceway enters outlet. Telecommunications outlets: a minimum of 4 11/16 inches square by 2 1/8 inches deep, except for wall mounted telephones . Mount outlet boxes flush in finished walls.

3.1.8.2 Pull Boxes

Construct of at least minimum size required by NFPA 70 of code-gauge aluminum or galvanized sheet steel, 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.

3.1.9 Mounting Heights

Mount panelboards, enclosed circuit breakers, and disconnecting switches so height of center of grip of the operating handle of the switch or circuit breaker at its highest position is maximum 79 inches above floor or working platform or as allowed in Section 404.8 per NFPA 70. Mount lighting switches 48 inches above finished floor. Mount receptacles and telecommunications outlets 18 inches above finished floor, unless otherwise indicated. Wall-mounted telecommunications outlets: mounted at height indicated. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets in non-hazardous areas to center of device or outlet. Measure mounting heights of receptacle outlet boxes in the hazardous area to the bottom of the outlet box.

3.1.10 Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, provide color coding by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, provide color coding by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with manufacturer's recommendations. Provide telecommunications system conductor identification as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEMS.

3.1.10.1 Marking Strips

Provide marking strips for identification of power distribution, control, data, and communications cables in accordance with the following:

a. Provide white or other light-colored plastic marking strips, fastened by screws to each terminal block, for wire designations.

b. Use permanent ink for the wire numbers

c. Provide reversible marking strips to permit marking both sides, or provide two marking strips with each block.

d. Size marking strips to accommodate the two sets of wire numbers.

e. Assign a device designation in accordance with NEMA ICS 1 to each device to which a connection is made. Mark each device terminal to which a connection is made with a distinct terminal marking corresponding to the wire designation used on the Contractor's schematic and connection diagrams.

f. The wire (terminal point) designations used on the Contractor's wiring diagrams and printed on terminal block marking strips may be according to the Contractor's standard practice; however, provide additional wire and cable designations for identification of remote (external) circuits for the Government's wire designations.

3.1.11 Splices

Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.1.11.1 Splices of Aluminum Conductors

Make with solderless circumferential compression-type, aluminum-bodied connectors UL listed for AL/CU. Remove surface oxides from aluminum conductors by wire brushing and immediately apply oxide-inhibiting joint compound and insert in connector. After joint is made, wipe away excess joint compound, and insulate splice.

3.1.12 Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

3.1.13 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings in accordance with Section 07 84 00.00 22 FIRESTOPPING.

3.1.14 Grounding and Bonding

Provide in accordance with NFPA 70 and NFPA 780. 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. Interconnect all grounding media in or on the structure to provide a common ground potential. This includes lightning protection, electrical service, telecommunications system grounds, as well as underground metallic piping systems. Make interconnection to the gas line on the customer's side of the meter. Use main size lightning conductors for interconnecting these grounding systems to the lightning protection system. In addition to the requirements specified herein, provide telecommunications grounding in accordance with TIA-607. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

3.1.14.1 Ground Rods

Provide ground rods and measure the resistance to ground using the fall-of-potential method described in IEEE 81. Do not exceed 25 ohms under normally dry conditions for the maximum resistance of a driven ground. If this resistance cannot be obtained with a single rod, additional rods, spaced on center. Spacing for additional rods must be a minimum of 10 feet, or if sectional type rods are used, additional sections may be coupled and driven with the first rod. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify the Contracting Officer who will decide on the number of ground rods to add.

3.1.14.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, excepting specifically those connections for which access for periodic testing is required, by exothermic weld or high 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 high compression connections using a hydraulic or electric 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.

3.1.14.3 Ground Bus

Provide a copper ground bus in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of transformer neutrals and other electrical equipment: effectively grounded by bonding to the ground bus. Bond the ground bus to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Make connections and splices of the brazed, welded, bolted, or pressure-connector type, except use pressure connectors or bolted connections for connections to removable equipment.

3.1.14.4 Resistance

Maximum resistance-to-ground of grounding system: do not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Contracting Officer for further instructions.

3.1.14.5 Telecommunications System

Provide telecommunications grounding in accordance with the following:

a. Telecommunications Grounding Busbars: Provide a Primary bonding busbar (PBB) in the telecommunications entrance facility. Install the PBB as close to the electrical service entrance grounding connection as practicable. Install Secondary bonding busbars to maintain

clearances as required by NFPA 70 and insulated from its support. A minimum of 2 inches separation from the wall is recommended to allow access to the rear of the busbar and adjust the mounting height to accommodate overhead or underfloor cable routing.

b. Telecommunications Bonding Conductors: Provide main telecommunications service equipment ground consisting of separate bonding conductor for telecommunications, between the PBB and readily accessible grounding connection of the electrical service. Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place grounding and bonding conductors in ferrous metallic conduit that exceeds 3 feet in length, bond the conductors to each end of the conduit using a grounding bushing or a No. 6 AWG conductor, minimum. Provide a telecommunications bonding backbone (TBB) that originates at the PBB extends throughout the building using the telecommunications backbone pathways, and connects to the SBBs in all telecommunications rooms and equipment rooms. Install the TBB conductors such that they are protected from physical and mechanical damage. The TBB conductors should be installed without splices and routed in the shortest possible straight-line path. Make the bonding conductor between a TBB and a SBB continuous. Where splices are necessary, the number of splices should be a minimum. Make the splices accessible and located in telecommunications spaces. Connect joined segments of a TBB using exothermic welding, irreversible compression-type connectors, or equivalent. Install all joints to be adequately supported and protected from damage. Whenever two or more TBBs are used within a multistory building, bond the TBBs together with a grounding equalizer (GE) at the top floor and at a minimum of every third floor in between. Do not connect the TBB and GE to the pathway ground, except at the PBB or the SBB.

c. Telecommunications Grounding Connections: Telecommunications grounding connections to the PBB: utilize listed compression two-hole lugs, exothermic welding, suitable and equivalent one hole non-twisting lugs, or other irreversible compression type connections. Bond all metallic pathways, cabinets, and racks for telecommunications cabling and interconnecting hardware located within the same room or space as the PBB to the PBB. In a metal frame (structural steel) building, where the steel framework is readily accessible within the room; bond each PBB to the vertical steel metal frame using a minimum No. 6 AWG conductor. Where the metal frame is external to the room and readily accessible, bond the metal frame to the SBB or PBB with a minimum No. 6 AWG conductor. When practicable because of shorter distances and, where horizontal steel members are permanently electrically bonded to vertical column members, the SBB may be bonded to these horizontal members in lieu of the vertical column members. All connectors used for bonding to the metal frame of a building must be listed for the intended purpose.

3.1.15 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.

3.1.16 Government-Furnished Equipment

Contractor rough-in for Government-furnished equipment to make equipment operate as intended, including providing miscellaneous items such as plugs, receptacles, wire, cable, conduit, flexible conduit, and outlet boxes or fittings.

3.1.17 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 3 feet avoiding 90 degree bends. Do not locate surge protective devices inside a panelboard or switchboard enclosure.

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 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.4 FIELD APPLIED PAINTING

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.5 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. Where applicable, test electrical equipment in accordance with NETA ATS.

3.5.1 Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

3.5.2 600-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 No. 6 AWG 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 per NETA ATS to provide direct reading of resistance. All existing wiring to be reused must also be tested.

3.5.3 Transformer Tests

Perform the standard, not optional, tests in accordance with the Inspection and Test Procedures for transformers, dry type, air-cooled, 600 volt and below; as specified in NETA ATS. Measure primary and secondary voltages for proper tap settings. Tests need not be performed by a recognized independent testing firm or independent electrical consulting firm.

3.5.4 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. Press the TEST button and then the RESET button to verify by LED status that the device is a self-test model as specified in UL 943.

3.5.5 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.

3.5.6 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.

-- End of Section --

SECTION 26 27 14.00 20

ELECTRICITY METERING
02/21, CHG 1: 05/21

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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.1	(2014; Errata 2016) Electric Meters - Code for Electricity Metering

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

ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 90.1 - SI	(2019; Errata 1-4 2020; Addenda BY-CP 2020; Addenda AF-DB 2020; Addenda A-G 2020; Addenda F-Y 2021; Errata 5-7 2021; Interpretation 1-4 2020; Interpretation 5-8 2021; Addenda AU-BF 2020) Energy Standard for Buildings Except Low-Rise Residential Buildings

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.90.1	(2013) Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
IEEE C57.13	(2016) Standard Requirements for Instrument Transformers

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2021) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C12.7	(2014) Requirements for Watthour Meter Sockets
ANSI C12.18	(2006; R 2016) Protocol Specification for ANSI Type 2 Optical Port
ANSI C12.20	(2015; E 2018) Electricity Meters - 0.1, 0.2, and 0.5 Accuracy Classes

NEMA C12.19 (2012) Utility Industry End Device Data Tables

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1) National Electrical Code

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Electricity Meters

Current Transformer

External Communications Devices

SD-06 Test Reports

Acceptance Checks and Tests

System Functional Verification

Building Meter Installation Sheet, per Building

Meter Configuration Template

Contractor must fill in the meter configuration template and submit to the Activity for concurrence.

Meter Configuration Report

The meter configuration report must be submitted as a Technical Data Package.

SD-10 Operation and Maintenance Data

Electricity Meters and Accessories, Data Package 5

Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and as specified herein.

SD-11 Closeout Submittals

System Functional Verification

1.3 QUALITY ASSURANCE

1.3.1 Installation Drawings

Drawings must be provided in hard-copy and electronic format, and must include but not be limited to the following:

a. Wiring diagrams with terminals identified of advanced meter, current transformers, potential transformers, protocol modules, communications interfaces, Ethernet connections, telephone lines. For each typical meter installation, provide a diagram.

b. One-line diagram, including meters, switch(es), current transformers, potential transformers, protocol modules, communications interfaces, Ethernet connections, telephone outlets, and fuses. For each typical meter installation, provide a diagram. Provide one-line diagram to the local Public Works department.

1.3.2 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 one year prior to bid opening. The one-year period must include applications of equipment and materials under similar circumstances and of similar size. The product, or an earlier release of the product, must have been on sale on the commercial market through advertisements, manufacturers catalogs, or brochures during the prior one-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.

1.3.3 Material and Equipment Manufacturing Data

Products manufactured more than 1 year prior to date of delivery to site must not be used, unless specified otherwise.

1.4 MAINTENANCE

1.4.1 Additions to Operation and Maintenance Data

In addition to requirements of Data Package 5, include the following on the actual electricity meters and accessories provided:

a. A condensed description of how the system operates

b. Block diagram indicating major assemblies

c. Troubleshooting information

d. Preventive maintenance

e. Prices for spare parts and supply list

1.5 WARRANTY

The equipment items and software must be supported by service organizations which are reasonably convenient to the equipment

installation in order to render satisfactory service to the equipment and software on a regular and emergency basis during the warranty period of the contract.

1.6 SYSTEM DESCRIPTION

1.6.1 System Requirements

Electricity metering, consisting of meters and associated equipment, will be used to record the electricity consumption and other values as described in the requirements that follow and as shown on the drawings. Communication system requirements are contained in a separate specification section as identified in paragraph COMMUNICATIONS INTERFACES.

1.6.2 Selection Criteria

Metering components and software are part of a system that includes the physical meter, data recorder function and communications method. Every building site identified must include sufficient metering components to measure the electrical parameters identified and to store and communicate the values as required.

Contractor must verify that the metering system installed on any building site is compatible with the facility-wide or base-wide communication and meter reading protocol system.

PART 2 PRODUCTS

2.1 ELECTRICITY METERS AND ACCESSORIES

Provide meter(s) and connect the meter(s) to the existing AMI DAS. The contractor must use the existing government laptop computers to configure the meter using existing software loaded on the computer. The contractor will not be allowed to modify any software or add any additional software to the computer. Alternatively, the government will configure the meter(s), which must be compatible with the existing system, using existing software. Contractor must insure that the meter(s) will transmit the specified data to the DAS. The current meters being used shall be verified with contracting officer.

2.1.1 Physical and Common Requirements

a. Provide metering system components in accordance with the Metering System Schedule shown in this specification. Provide Meter configuration template.

b.

c. Meter must have NEMA 3R stainless steel enclosure for surface mounting with bottom or rear penetrations.

d. Surge withstand capability must conform to IEEE C37.90.1.

e. Use #12 SIS (XHHW, or equivalent) wiring with ring lugs for all meter connections. Color code and mark the conductors as follows:

   (1) Red - Phase A CT - C1
   (2) Orange - Phase B CT - C2
   (3) Brown - Phase C CT - C3

(4) Gray with white stripe - neutral current return - C0
(5) Black - Phase A voltage - V1
(6) Yellow - Phase B voltage - V2
(7) Blue - Phase C voltage - V3
(8) White - Neutral voltage

2.1.2 Current Transformer Requirements

a. Current transformer must be installed with a rating as shown in the schedule.

b. Current transformers must have an Accuracy Class of 0.15 (with a maximum error of plus/minus 0.3 percent at 5.0 amperes) when operating within the specified rating factor.

c. Current transformers must be solid-core, bracket-mounted for new installations using ring-tongue lugs for electrical connections. Current transformers must be accessible and the associated wiring must be installed in an organized and neat workmanship arrangement. Current transformers that are retrofitted onto existing switchgear busbar can be a busbar split-core design.

d. Current transformers must have:

(1) Insulation Class: All 600 volt and below current transformers must be rated 10 KV BIL.

(2) Frequency: Nominal 60 Hz.

(3) Burden: Burden class must be selected for the load.

(4) Phase Angle Range: 0 to 60 degrees.

e. Meter must accept current input from standard instrument transformers (5A secondary current transformers).

f. Current inputs must have a continuous rating in accordance with IEEE C57.13.

g. Provide one single-ratio current transformer for each phase per power transformer with characteristics listed in the following table.

Single-Ratio Current Transformer Characteristics				
kVA	Sec. Volt	CT Ratio	RF	Meter Acc. Class
500	208Y:120	1200:5	1.33	0.3 thru B0.05

2.1.3 Meter Requirements

Electricity meters must include the following features:

a. Meter must comply with ANSI C12.1, NEMA C12.19, and ANSI C12.20 and must match existing AMI meter system at the installation and be the newest version with ATO.

b. Meter sockets must comply with ANSI C12.7.

e. Provide socket-mounted or panel mounted meters as indicated on the meter schedule.

f. Meter must be a Class 20, transformer rated design.

h. Meter must be rated for use at temperature from minus 40 degrees Centigrade to plus 70 degrees Centigrade.

i. The meters must have an electronic demand recording register and must be secondary reading as indicated. The register must be used to indicate maximum kilowatt demand as well as cumulative or continuously cumulative demand. Demand must be measured on a block-interval basis and must be capable of a 5 to 60 minute interval and initially set to a 15-minute interval. It must have provisions to be programmed to calculate demand on a rolling interval basis. Meter readings must be true RMS.

j. The meter electronic register must be of modular design with non-volatile data storage. Downloading meter stored data must be capable via an optical port. Recording capability of data storage with a minimum capability of 89 days of 15 minute, 2 channel interval data. The meter must be capable of providing at least 2 KYZ pulse outputs (dry contacts). Default initial configuration (unless identified otherwise by base personnel) must meet NAVFAC CIRCUITS Call for Consistency document located on the NAVFAC CIRCUITS Portal and must be:

(1) First channel - kWh
(2) Second channel - kVARh
(3) KYZ output #1 - kWh
(4) KYZ output #2 - kVARh

k. All meters must have identical features available in accordance with this specification. The meter schedule identifies which features must be activated at each meter location.

l. Enable switches for Time of Use (TOU), pulse and load profile measurement module at the factory.

m. Meter must have an optical port on front of meter. Optical device must be compatible with ANSI C12.18.

n. Meters must be 120-480 volts auto ranging.

o. Provide blank tag fixed to the meter faceplate for the addition of the meter multiplier, which will be the product of the current transformer ratio and will be filled in by base personnel on the job site. The meter's nameplate must include:

(1) Meter ID number.
(2) Rated voltage.
(3) Current class.
(4) Metering form.
(5) Test amperes.
(6) Frequency.

(7) Catalog number.
(8) Manufacturing date.

p. On switchboard style installations, provide switchboard case with disconnect means for meter removal incorporating short-circuiting of current transformer circuits.

q. Meter covers must be polycarbonate resins with an optical port and reset. Backup battery must be easily accessible for change-out after removing the meter cover.

r. The normal billing data scroll must be fully programmable. The normal billing data scroll requirements provided in the CIRCUITS Call for Consistency Document located on the NAVFAC CIRCUITS Portal. Data scroll display must include the following.

(1) Number of demand resets.
(2) End-of-interval indication.
(3) Maximum demand.
(4) New maximum demand indication.
(5) Cumulative or continuously cumulative.
(6) Time remaining in interval.
(7) Kilowatt hours.

s. The register must incorporate a built-in test mode that allows it to be tested without the loss of any data or parameters. The following quantities must be available for display in the test mode:

(1) Present interval's accumulating demand.
(2) Maximum demand.
(3) Number of impulses being received by the register.

t. Pulse module simple I/O board with programmable ratio selection.

u. Meters must be programmed after installation via an optical port. Optical display must show TOU data, peak kWh, semi-peak kWh, off peak kWh, and phase angles.

v. Self-monitoring to provide for:

(1) Unprogrammed register.
(2) RAM checksum error.
(3) ROM checksum error.
(4) Hardware failure.
(5) Memory failure.
(6) EPROM error.
(7) Battery status (fault, condition, or time in service).

w. Liquid crystal alphanumeric displays, 9 digits, blinking squares confirm register operation. Six Large digits for data and smaller digits for display identifier.

x. Display operations, programmable sequence with display identifiers. Display identifiers must be selectable for each item. Continually sequence with time selectable for each item.

y. The meters must support three modes of registers: Normal Mode, Alternate Mode, and Test Mode. The meter also must support a "Toolbox" or "Service Information" (accessible in the field) through

an optocom port to a separate computer using the supplied software to allow access to instantaneous service information such as voltage, current, power factor, load demand, and the phase angle for individual phases.

z. Meter must have a standard 4 -year warranty.

2.1.4 Disconnect Method

a. Provide a 10-pole safety disconnect complete with isolation devices for the voltage and current transformer inputs, including a shorting means for the current transformers.

b. Disconnecting wiring blocks must be provided between the current transformer and the meter. A shorting mechanism must be built into the wiring block to allow the current transformer wiring to be changed without removing power to the transformer. The wiring blocks must be located where they are accessible without the necessity of disconnecting power to the transformer.

c. Voltage monitoring circuits must be equipped with disconnect switches to isolate the meter base or socket from the voltage source.

2.1.5 Installation Methods

a. Transformer Mounted ("XFMR" in Metering Systems Schedule). Meter base must be located outside on the secondary side of the pad-mounted transformer.

b. Stand Mounted Adjacent to Transformer ("STAND" in Metering Systems Schedule). Meter base must be mounted on a structural steel pole approximately 4 feet from the transformer pad. This can be used for multiple meters associated with a single transformers.

c. Building Mounted ("BLDG" in Metering Systems Schedule). Meter base must be mounted on the side of the existing building near the service entrance.

d. Panel Mounted. ("PNL" in Metering Systems Schedule). Meter must be mounted where directed.

e. Commercial meter pedestal ("PED" in Metering Systems Schedule).

2.2 COMMUNICATIONS INTERFACES

Meter must have two-way communication with the existing data acquisition system (DAS). Provide a communications interface utilizing base standards..

Provide interfacing software if a meter is used that is different than the existing meters at the Activity to ensure compatibility within the metering system.

Connect to the AMI network utilizing base standards..

2.3 METERING SYSTEM SCHEDULE

Comply with all base standards.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations must conform to ASHRAE 90.1 - IP, ASHRAE 90.1 - SI IEEE C2, NFPA 70 (National Electrical Code), and to the requirements specified herein. Provide new equipment and materials unless indicated or specified otherwise.

3.1.1 Scheduling of Work and Outages

The Contract Clauses must govern regarding permission for power outages, scheduling of work, coordination with Government personnel, and special working conditions.

3.2 FIELD QUALITY CONTROL

Perform the following acceptance checks and tests on all installed meters.

3.2.1 Performance of 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 NETA ATS.

a. Meter Assembly

(1) Visual and mechanical inspection.

(a) Compare equipment nameplate data with specifications and approved shop drawings.

(b) Inspect physical and mechanical condition. Confirm the meter is firmly seated in the socket, the socket is not abnormally heated, the display is visible, and the ring and seal on the cover are intact.

(c) Inspect all electrical connections to ensure they are tight. For Class 200 services, verify tightness of the service conductor terminations for high resistance using low-resistance ohmmeter, or by verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method.

(d) Record model number, serial number, firmware revision, software revision, and rated control voltage.

(e) Verify operation of display and indicating devices.

(f) Record password and user log-in for each meter.

(g) Verify grounding of metering enclosure.

(h) Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements. Verify that the CT ratio and the PT ratio are properly included in the meter multiplier or the programming of the meter. Confirm that the multiplier is provided on the meter face or on the meter.

(i) Provide building meter installation sheet, per building for each facility. See example Graphic E-S1.

(2) Electrical tests.

(a) Apply voltage or current as appropriate to each analog input and verify correct measurement and indication.

(b) Confirm correct operation and setting of each auxiliary input/output feature including mechanical relay, digital, and analog.

(c) After initial system energization, confirm measurements and indications are consistent with loads present.

(d) Make note of, and report, any "Error-Code" or "Caution-Code" on the meter's display.

(3) Provide meter configuration report.

b. Current Transformers

(1) Visual and mechanical inspection.

(a) Compare equipment nameplate data with specification and approved shop drawings.

(b) Inspect physical and mechanical condition.

(c) Verify correct connection, including polarity.

(d) Inspect all electrical connections to ensure they are tight.

(e) Verify that required grounding and shorting connections provide good contact.

(2) Electrical Tests.

Verify proper operation by reviewing the meter configuration report.

3.2.2 System Functional Verification

Verify that the installed meters are working correctly in accordance with the meter configuration report:

a. The correct meter form is installed.

b. All voltage phases are present.

c. Phase rotation is correct.

d. Phase angles are correct.

e. The new meter accurately measures power magnitude and direction, and can communicate as required by paragraph COMMUNICATIONS INTERFACES.

-- End of Section --

SECTION 26 51 00

INTERIOR LIGHTING
05/20, CHG 2: 11/21

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.

ASTM INTERNATIONAL (ASTM)

ASTM A580/A580M	(2018) Standard Specification for Stainless Steel Wire
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1008/A1008M	(2024) 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 B164	(2003; R 2014) Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire
ASTM B633	(2023) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM D4674 REV A	(2002; R 2010) Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments

EUROPEAN UNION (EU)

Directive 2011/65/EU	(2011) Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

ILLUMINATING ENGINEERING SOCIETY (IES)

ANSI/IES LM-79	(2019) Approved Method: Electrical and Photometric Measurements of Solid State Lighting Products
ANSI/IES LM-80	(2020) Approved Method: Measuring Luminous Flux and Color Maintenance of LED

	Packages, Arrays and Modules
ANSI/IES LS-1	(2020) Lighting Science: Nomenclature and Definitions for Illuminating Engineering
ANSI/IES TM-15	(2020) Technical Memorandum: Luminaire Classification System for Outdoor Luminaires
ANSI/IES TM-21	(2019) Technical Memorandum: Projecting Long-Term Lumen, Photon, and Radiant Flux Maintenance of LED Light Sources
ANSI/IES TM-30	(2020) Technical Memorandum: IES Method for Evaluating Light Source Color Rendition
IES Lighting Library	IES Lighting Library

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE C2	(2023) National Electrical Safety Code
IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 77	(2017) Temporal Light Artifacts: Test Methods and Guidance for Acceptance Criteria
NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ANSLG C78.377	(2017) Electric Lamps— Specifications for the Chromaticity of Solid State Lighting Products
NEMA C82.77-10	(2020) Harmonic Emission Limits - Related Power Quality Requirements
NEMA SSL 1	(2016) Electronic Drivers for LED Devices, Arrays, or Systems
NEMA SSL 3	(2011) High-Power White LED Binning for General Illumination
NEMA SSL 7A	(2015) Phase-Cut Dimming for Solid State Lighting: Basic Compatibility
NEMA WD 1	(1999; R 2020) Standard for General Color Requirements for Wiring Devices
NEMA WD 7	(2011; R 2016) Occupancy Motion Sensors Standard

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 101	(2024) Life Safety Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 20	(2018; Reprint Jan 2021) UL Standard for Safety General-Use Snap Switches
UL 94	(2013; Reprint Apr 2022) UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 508	(2018; Reprint Jul 2021) UL Standard for Safety Industrial Control Equipment
UL 916	(2015; Reprint Oct 2021) UL Standard for Safety Energy Management Equipment
UL 924	(2016; Reprint May 2020) UL Standard for Safety Emergency Lighting and Power Equipment
UL 1472	(2015) UL Standard for Safety Solid-State Dimming Controls
UL 1598	(2021; Reprint Jun 2021) Luminaires
UL 2043	(2013) Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
UL 8750	(2015; Reprint Jul 2021) UL Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products

1.2 RELATED REQUIREMENTS

Materials not considered to be luminaires, luminaire accessories, or lighting equipment are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.3 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications and on the drawings, must be as defined in IEEE 100 and ANSI/IES LS-1.

b. For LED luminaire light sources, "Useful Life" is the operating hours

before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in ANSI/IES LM-80.

c. For LED luminaires, "Luminaire Efficacy" (LE) is the appropriate measure of energy efficiency, measured in lumens/watt. This is gathered from LM-79 data for the luminaire, in which absolute photometry is used to measure the lumen output of the luminaire as one entity, not the source separately and then the source and housing together.

d. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current.

1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Luminaires

Light Sources

LED Drivers

Luminaire Warranty

Lighting Controls Warranty

Switches

Wall Box Dimmers

Occupancy/Vacancy Sensors

Power Packs

Exit Signs

Emergency Drivers

SD-06 Test Reports

ANSI/IES LM-79 Test Report

ANSI/IES LM-80 Test Report

ANSI/IES TM-21 Test Report

ANSI/IES TM-30 Test Report

Occupancy/Vacancy Sensor Verification Test

SD-07 Certificates

LED Driver and Dimming Switch Compatibility Certificate

SD-10 Operation and Maintenance Data

Lighting System, Data Package 5

1.5 QUALITY ASSURANCE

Data, drawings, and reports must employ the terminology, classifications and methods prescribed by the IES Lighting Library as applicable, for the lighting system specified.

1.5.1 ANSI/IES LM-79 Test Report

Submit test report on manufacturer's standard production model of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data in IES format as outlined under "14.0 Test Report" in ANSI/IES LM-79.

1.5.2 ANSI/IES LM-80 Test Report

Submit report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data as outlined under "8.0 Test Report" in ANSI/IES LM-80.

1.5.3 ANSI/IES TM-21 Test Report

Submit test report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data, as well as required interpolation information as outlined under "7.0 Report" in ANSI/IES TM-21.

1.5.4 ANSI/IES TM-30 Test Report

Submit color vector graphic in accordance with ANSI/IES TM-30 on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Include spectral distribution of test LED light source.

1.5.5 LED Driver and Dimming Switch Compatibility Certificate

Submit certification from the luminaire, driver, or dimmer switch manufacturer that ensures compatibility and operability between devices without flickering and to specified dimming levels.

1.5.6 Test Laboratories

Test laboratories for the ANSI/IES LM-79 and ANSI/IES LM-80 test reports must be one of the following:

a. National Voluntary Laboratory Accreditation Program (NVLAP) accredited for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program for both LM-79 and LM-80 testing.

b. One of the qualified labs listed on the Department of Energy - LED Lighting Facts Approved Testing Laboratories List for LM-79 testing.

c. One of the EPA-Recognized Laboratories listed for LM-80 testing.

1.5.7 Regulatory Requirements

Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of NFPA 70, unless more stringent requirements are specified or indicated. Provide luminaires and assembled components that are approved by and bear the label of UL for the applicable location and conditions unless otherwise specified.

1.5.8 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 six months prior to bid opening. The six-month 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 six-month 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.

1.5.8.1 Alternative Qualifications

Products having less than a six-month 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.

1.5.8.2 Material and Equipment Manufacturing Date

Do not use products manufactured more than six months prior to date of delivery to site, unless specified otherwise.

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 Luminaire Warranty

Provide and transfer to the government the original LED luminaire manufacturers standard commercial warranty for each different luminaire manufacturer used in the project.

a. Provide a written five year minimum replacement warranty for material, luminaire finish, and workmanship. Provide written warranty document that contains all warranty processing information needed, including customer service point of contact, whether or not a return authorization number is required, return shipping information, and closest return location to the luminaire location.

(1) Finish warranty must include failure and substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

(2) Material warranty must include:

(a) All LED drivers and integral control equipment.

(b) Replacement when more than 15 percent of LED sources in any lightbar or subassembly(s) are defective, non-starting, or operating below 70 percent of specified lumen output.

b. Warranty period must begin in accordance with the manufacturer's standard warranty starting date.

c. Provide replacements that are promptly shipped, without charge, to the using Government facility point of contact and that are identical to or an improvement upon the original equipment. All replacements must include testing of new components and assembly.

1.6.2 Lighting Controls Warranty

Provide and transfer to the government the original lighting controls manufacturers standard commercial warranty for each different lighting controls manufacturer used in the project. Warranty coverage must begin from date of final system commissioning or three months from date of delivery, whichever is the earliest. Warranty service must be performed by a factory-trained engineer or technician.

a. Unless otherwise noted, provide a written five year minimum warranty on the complete system for all systems with factory commissioning. Provide warranty that covers 100 percent of the cost of any replacement parts and services required over the five years which are directly attributable to the product failure. Failures include, but are not limited to, the following:

(1) Software: Failure of input/output to execute switching or dimming commands.

(2) Damage of electronic components due to transient voltage surges.

(3) Failure of control devices, including but not limited to occupancy sensors, photosensors, and manual wall station control devices.

b. Provide a written five year minimum warranty on all input devices against defect in workmanship or materials provided by device manufacturer.

c. Provide a written five year minimum warranty on all control components attached to luminaires against defect in workmanship or materials.

1.7 OPERATION AND MAINTENANCE MANUALS

1.7.1 Lighting System

Provide operation and maintenance manuals for the lighting system in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA that provide basic data relating to the design, operation, and maintenance of the lighting system for the building. Include the following:

a. Manufacturers' operating and maintenance manuals.

b. Luminaire shop drawings for modified and custom luminaires.

c. Luminaire Manufacturers' standard commercial warranty information as specified in paragraph LUMINAIRE WARRANTY.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

2.2 LUMINAIRES

UL 1598, NEMA C82.77-10. Provide luminaires as indicated in the luminaire schedule and NL plates or details on project plans, complete with light source, wattage, and lumen output indicated. All luminaires of the same type must be provided by the same manufacturer. Luminaires must be specifically designed for use with the driver and light source provided.

2.2.1 Luminaires

UL 8750, ANSI/IES LM-79, ANSI/IES LM-80. For all luminaires, provide:

a. Complete system with LED drivers and light sources.

b. Housings constructed of non-corrosive materials. All new aluminum housings must be anodized or powder-coated. All new steel housings must be treated to be corrosion resistant.

c. ANSI/IES TM-21, ANSI/IES LM-80. Minimum L70 lumen maintenance value of 50,000 hours unless otherwise indicated in the luminaire schedule. Luminaire drive current value must be identical to that provided by test data for luminaire in question.

d. Minimum efficacy as specified in the luminaire schedule. Theoretical models of initial lamp lumens per watt are not acceptable. If efficacy values are not listed in the luminaire schedule, provide luminaires that meet the following minimum values:

Luminaire Style	Minimum Luminaire Efficacy
Recessed 1 by 4, 2 by 4, and 2 by 2	100 LPW
Recessed Downlight (fixed, adjustable, wallwash)	80 LPW

Luminaire Style	Minimum Luminaire Efficacy
High Bay, Low Bay, and Industrial Locations	100 LPW
Exterior Wall Sconce	50 LPW

e. UL listed for dry or damp location typical of interior installations. Any luminaire mounted on the exterior of the building must be UL listed for wet location typical of exterior installations.

f. LED driver and light source package, array, or module are accessible for service or replacement without removal or destruction of luminaire.

g. Lenses constructed of heat tempered borosilicate glass, UV-resistant acrylic, or silicone. Provide polycarbonate vandal-resistant lenses as indicated. Sandblasting, etching and polishing must be performed as indicated in the luminaire description.

h. ANSI/IES TM-15. Provide exterior building-mounted luminaires that do not exceed the BUG ratings as listed in the luminaire schedule. If BUG ratings are not listed in the luminaire schedule, provide luminaires that meet the following minimum values for each application and mounting conditions:

Lighting Application	Mounting Conditions	BUG Rating
Exterior Wall Sconce	Above 4 feet AFF	B1-U0-G2
Exterior Wall Sconce	Below or at 4 feet AFF	B4-U0-G4
Steplight	Above 4 feet AFF	B1-U1-G2
Steplight	Below or at 4 feet AFF	B4-U1-G4
Parking Garage Luminaire	Ceiling mounted	B4-U4-G3

2.3 LIGHT SOURCES

NEMA ANSLG C78.377, NEMA SSL 3. Provide type, delivered lumen output, and wattage as indicated in the luminaire schedule on project plans.

2.3.1 LED Light Sources

Provide LED light sources that meet the following requirements:

a. NEMA ANSLG C78.377. Emit white light and have a nominal CCT of 3500 Kelvin.

b. Minimum Color Rendering Index (CRI) of 80.

c. Directive 2011/65/EU. Restriction of Hazardous Substances (RoHS) compliant.

d. Light source color consistency by utilizing a binning tolerance within a 3-step McAdam ellipse.

2.4 LED DRIVERS

NEMA SSL 1, UL 8750. Provide LED drivers that are electronic, UL Class 1 or Class 2, constant-current type and that comply with the following requirements:

a. The combined driver and LED light source system does not exceed the minimum luminaire efficacy values as listed in the luminaire schedule provided.

b. Operates at a voltage of 120 volts at 50/60 hertz, with input voltage fluctuations of plus/minus 10 percent.

c. Power Factor (PF) greater than or equal to 0.90 at full input power and across specified dimming range.

d. Maximum Total Harmonic Distortion (THD) less than 20 percent at full input power and across specified dimming range.

e. Operates for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.

f. Withstands Category A surges of 2 kV without impairment of performance. Provide surge protection that is integral to the driver.

g. Integral thermal protection that reduces the output power to protect the driver and light source from damage if the case temperature approaches or exceeds the driver's maximum operating temperature.

h. 47 CFR 15. Complies with the requirements of the Federal Communications Commission (FCC) rules and regulations, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

i. Class A sound rating.

j. Directive 2011/65/EU. Restriction of Hazardous Substances (RoHS) compliant.

k. Provide dimming capability as indicated in the luminaire schedule on project plans. Dimmable drivers must dim down to 10 percent. Dimmable drivers must be controlled by a Class 2 low voltage 0-10VDC controller dimming signal protocol unless otherwise specified. LED drivers of the same family/series must track evenly across multiple luminaires at all light levels.

2.4.1 Remote LED Drivers

Provide remote LED Drivers that are UL listed for dry locations typical of interior installations. Provide LED driver in junction box or housing with mounting plate. Housing must allow for field connections to occur inside the housing or must contain mechanical connections.

2.5 LIGHTING CONTROLS

Provide lighting control systems that do not switch off battery-operated or emergency backup luminaires or exit signs in path of egress. Provide system with override of lighting control devices controlling luminaires in path of egress with activation of fire alarm system.

2.5.1 Devices

2.5.1.1 Switches

Provide line-voltage toggle switches as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. When used for non-digital loads, devices must be rated at 20 Amps inductive load, and be compatible with the lighting control systems.

2.5.1.2 Wall Box Dimmers

UL 1472, UL 20, IEEE C62.41, NEMA 77, NEMA SSL 7A. Dimmers must provide flicker-free, continuously variable light output throughout the dimming range of 10 percent to 100 percent. Devices must be capable of operating at their full rated capacity regardless of being single or ganged-mounted, and be compatible with three-way and four-way switching scenarios.

Provide wall-box dimmers that meet the following requirements:

a. Device operates as an independent control device.

b. Device operates with the use of a vertical slider, paddle, rotary, button, or toggle with adjacent vertical slider.

c. Finish of device matches switches and outlets in the same area.

d. Back box in wall has sufficient depth to accommodate body of switch and wiring.

e. Dimmer is capable of controlling 0-10 volt LED drivers. Dimmers and the drivers they control must be provided from the same manufacturer or tested and certified as compatible for use together.

f. Radio frequency interference suppression is integral to device.

2.5.1.3 Occupancy/Vacancy Sensors

IEEE C62.41, NEMA WD 1, UL 94, UL 916, UL 508, ASTM D4674 REV A, NEMA WD 7. Provide occupancy/vacancy sensors with coverage patterns as indicated on project plans. Provide no less quantity of sensors as shown on plans, but add additional sensors when required to fulfill coverage requirement for the specific model of sensor provided. Provide occupancy sensor operation that requires movement to activate luminaires controlled and turns luminaires off after a set time of inactivity. Provide ceiling or wall-mounted occupancy/vacancy sensors that meet the following

requirements:

a. Operating voltage of 120 volts.

b. Time delay of 30 seconds to 30 minutes with at least four intermediate time delay settings.

c. Sensors are ceiling mountedwall-box mounted.

d. Does not exceed a maximum load requirement of 20mA at 24VDC. No minimum load requirement and be capable of switching from zero to 800 W at 120 VAC, 50/60 Hz and from zero to 1200 W at 277 VAC, 50/60 Hz.

e. Shielded or controlled by internal logic to adjust sensitivity to avoid false triggering due to ambient temperature, air temperature variations or HVAC air movement.

f. Sensor is equipped to automatically energize the connected load upon loss of normal power when located in a means of egress.

g. Occupancy and vacancy operation is field-adjustable and programmable with push-button or dip switch on the sensor device.

h. No leakage current to load when in the off mode.

i. Utilize zero-crossing circuitry to prevent damage from high inrush current and to promote long life operation.

2.5.1.3.1 Passive Infrared Sensors

Provide Passive Infrared Sensors (PIR) sensors that detect occupancy by sensing heat and movement in the area of coverage. Provide sensors are constructed of a housing of high-impact, injection-molded thermoplastic. Provide PIR sensors that are temperature compensated, with a dual element sensor and a multi-element fresnel lens of POLY IR4 material.

2.5.1.3.2 Ultrasonic Sensors

Provide ultrasonic sensors that detect occupancy by sensing a change in pattern of reflected ultrasonic waves in the area of coverage. Provide sensors that are constructed of a housing of high-impact, injection-molded thermoplastic. Provide ultrasonic sensors that operate at 40 kHz.

2.5.1.3.3 Dual Technology Sensors

Provide dual technology sensors that meet the requirements for PIR sensors and ultrasonic sensors indicated above. If either the PIR or ultrasonic sensing registers occupancy, the luminaires must remain on.

2.5.1.3.4 Power Packs

UL 2043. Provide power packs to provide power to lighting control sensors as required in accordance with the manufacturer's specifications. Provide power packs that meet the following requirements:

a. Operate at an input voltage of 120 VAC, with an output voltage 12-24 VDC at 225 mA.

b. Constructed of plenum-rated, high-impact thermoplastic enclosure.

c. Utilizes zero-crossing circuitry to prevent damage from inrush current.

d. Maximum load rating of 16 amps for electronic lighting loads.

e. Directive 2011/65/EU. Restriction of Hazardous Substances (RoHS) compliant.

2.6 EXIT AND EMERGENCY LIGHTING EQUIPMENT

2.6.1 Exit Signs

UL 924, NFPA 101. Provide wattage as indicated in the luminaire schedule on project plans. Provide LED Exit Signs that meet the following criteria:

a. Housing constructed of clear polycarbonate housing.

b. UL listed for dampwet location.

c. Configured for universal mounting.

d. 6 inch high, 3/4 inch stroke red lettering on face of sign with chevrons on either side of lettering to indicate direction.

e. Single or double face as indicated in project plans and luminaire schedule.

2.6.1.1 Exit Signs with Battery Backup

Equip with automatic power failure device, test switch, and pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery must be sealed, maintenance free nickel-cadmium type, and must operate unattended for a period of not less than five years. Emergency run time must be a minimum of 1-1/2 hours. LEDs must have a minimum rated life of 10 years. Provide self-diagnostic circuitry integral to emergency LED driver. In lieu of battery, can use a nonradioactive photoluminescent plate.

2.6.2 Emergency Lighting Unit (ELU)

UL 924, NFPA 101. Provide emergency lighting units (ELUs) completely assembled with wiring and mounting devices, ready for installation at the locations indicated. Provide in UV-stable, thermo-plastic housing with UL damp label UL wet label as indicated. Emergency lighting units must be rated for 12 volts, except units having no remote-mounted light sources and having no more than two unit-mounted light sources may be rated six volts. Equip units with brown-out sensitive circuit to activate battery when input voltage falls to 75 percent of normal. Equip with two LED light sources, automatic power failure device, test switch, and pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery must be sealed, maintenance free nickel-cadmium type, and must operate unattended for a period of not less than five years. Emergency run time must be a minimum of 90 minutes. LEDs must have a minimum rated life of 10 years. Provide self-diagnostic circuitry integral to emergency LED driver.

2.6.3 LED Emergency Drivers

UL 924, NFPA 101. Provide LED emergency driver with automatic power

failure detection, test switch and LED indicator (or combination switch/indicator) located on luminaire exterior, and fully-automatic solid-state charger, battery and inverter integral to a self-contained housing. Provide self-diagnostic function integral to emergency driver. Integral nickel-cadmiumlead-calcium battery is required to supply a minimum of 90 minutes of emergency power at 5 watts, 10-50 VDC, constant output. Driver must be RoHS compliant, rated for installation in plenum-rated spaces and damp locations, and be warranted for a minimum of five years.

2.6.4 Self-Diagnostic Circuitry for LED Drivers

UL 924, NFPA 101. Provide emergency lighting unit with fully-automatic, integral self-testing/diagnostic electronic circuitry. Circuitry must provide for a one minute diagnostic test every 28 days, and a 30 minute diagnostic test every six months, minimum. Any malfunction of the unit must be indicated by LED(s) visible from the exterior of the luminaire. A manual test switch must also be provided to perform a diagnostic test at any given time.

2.7 LUMINAIRE MOUNTING ACCESSORIES

2.7.1 Suspended Luminaires

a. Provide hangers capable of supporting twice the combined weight of luminaires supported by hangers.

b. Hangers must allow luminaires to swing within an angle of 45 degrees. Brace pendents 4 feet or longer to limit swinging.

c. Single-unit suspended luminaires must have cabletwin-stem hangers. Multiple-unit or continuous row luminaires with a separate power supply cord must have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end.

d. Provide all linear pendent and surface mounted luminaires with two supports per four-foot section or three per eight-foot section unless otherwise recommended by manufacturer.

2.7.2 Recess and Surface Mounted Luminaires

Provide access to light source and LED driver from bottom of luminaire. Provide trim and lenses for the exposed surface of flush-mounted luminaires as indicated on project drawings and specifications. Luminaires recessed in ceilings which have a fire resistive rating of one hour or more must be enclosed in a box which has a fire resistive rating equal to that of the ceiling. For surface mounted luminaires with brackets, provide flanged metal stem attached to outlet box, with threaded end suitable for supporting the luminaire rigidly in design position. Flanged part of luminaire stud must be of broad base type, secured to outlet box at not fewer than three points.

2.7.3 Luminaire Support Hardware

2.7.3.1 Wire

ASTM A641/A641M. Galvanized, soft tempered steel, minimum 0.11 inches in diameter, or galvanized, braided steel, minimum 0.08 inches in diameter.

2.7.3.2 Wire for Humid Spaces

ASTM A580/A580M. Composition 302 or 304, annealed stainless steel, minimum 0.11 inches in diameter.

ASTM B164. UNS NO4400, annealed nickel-copper alloy, minimum 0.11 inches in diameter.

2.7.3.3 Threaded Rods

Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

2.7.3.4 Straps

Galvanized steel, one by 3/16 inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.8 EQUIPMENT IDENTIFICATION

2.8.1 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.

2.8.2 Labels

UL 1598. All luminaires must be clearly marked for operation of specific light sources and LED drivers. The labels must be easy to read when standing next to the equipment, and durable to match the life of the equipment to which they are attached. Note the following light source characteristics in the format "Use Only _____":

a. Correlated Color Temperature (CCT) and Color Rendering Index (CRI) for all luminaires.

b. Driver and dimming protocol.

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. LED drivers must have clear markings indicating dimming type and indicate proper terminals for the various outputs.

2.9 FACTORY APPLIED FINISH

NEMA 250. Provide all luminaires and lighting equipment with factory-applied painting system that as a minimum, meets requirements of corrosion-resistance testing.

PART 3 EXECUTION

3.1 INSTALLATION

IEEE C2, NFPA 70.

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 (CCT), color rendering index (CRI), 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. Provide accessories as required for ceiling construction type indicated on Finish Schedule. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed. Provide wires, straps, or rods for luminaire support in this section. Install luminaires with vent holes free of air blocking obstacles.

3.1.2.1 Suspended Luminaires

Measure mounting heights from the bottom of the luminaire for ceiling-mounted luminaires and to center of luminaire for wall-mounted luminaires. Obtain architect 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. Support suspended luminaires from structural framework of ceiling or from inserts cast into slab.

a. Provide suspended luminaires with 45 degree swivel hangers so that they hang plumb and level.

b. Locate so that there are no obstructions within the 45 degree range in all directions.

c. The stem, canopy and luminaire must be capable of 45 degree swing.

d. Rigid pendent stem, aircraft cable, rods, or chains 4 feet or longer excluding luminaire must be braced to prevent swaying using three cables at 120 degree separation.

e. Suspended luminaires in continuous rows must have internal wireway systems for end to end wiring and must be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces.

f. Utilize aligning splines on extruded aluminum luminaires to assure minimal hairline joints.

g. Support steel luminaires to prevent "oil-canning" effects.

h. Match supporting pendents with supported luminaire. Aircraft cable must be stainless steel.

i. Match finish of canopies to match the ceiling, and provide low profile canopies unless otherwise shown.

j. Maximum distance between suspension points must be 10 feet or as recommended by the manufacturer, whichever is less.

3.1.2.2 Recessed and Semi-Recessed Luminaires

a. Support recessed and semi-recessed luminaires independently from the building structure by a minimum of two wires, straps or rods per luminaire and located near opposite corners of the luminaire. Secure horizontal movement with clips provided by manufacturer. Ceiling grid clips are not allowed as an alternative to independently supported luminaires.

b. Support round luminaires or luminaires smaller in size than the ceiling grid independently from the building structure by a minimum of four wires, straps or rods per luminaire, spaced approximately equidistant around.

c. Do not support luminaires by acoustical tile ceiling panels.

d. 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 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the luminaire.

e. Luminaires installed in suspended ceilings must also comply with the requirements of Section 09 51 00 ACOUSTICAL CEILINGS.

f. Adjust aperture rings on all applicable ceiling recessed luminaires to accommodate various ceiling material thickness. Coordinate cut-out size in ceiling to ensure aperture covers cut-out entirely. Install aperture rings such that the bottom of the ring is flush with finished ceiling or not more than 1/16 inch above. Do not install luminaires such that the aperture ring extends below the finished ceiling surface.

g. For luminaire recessed in plaster ceilings, provide plaster frames for setting. Install setting such that the bottom of the frame is flush with finished ceiling. Support luminaires with plaster frames utilizing yokes or leveling lugs. Do not mount luminaires or support elements to ducts or pipes. Yokes must support a luminaire by no fewer than two bolts each.

3.1.3 LED Drivers

Provide LED drivers integral to luminaire as constructed by the manufacturer.

3.1.3.1 Remote LED Drivers

Locate Remote LED Drivers within the maximum distance allowed to minimize voltage drop. Do not locate remote LED drivers further from the light source than specified by the manufacturer. Locate remote LED drivers in dry, well-ventilated, and accessible location, above accessible ceilings or behind a removable wall or ceiling panel. Mount housing or junction box so that it is rigidly and securely fastened in place. Install LED drivers such that components are not in contact with combustible materials unless listed for such condition. Remote LED drivers must be grounded in accordance with NFPA 70.

Provide separate compartments for Class 2 wiring connections and for Class 1 wiring connections. Separation must be barrier-type within the same box or separate boxes with close connector conduit fittings. Field

connections must be inside housing or junction box or secured by a quick disconnect wire connector.

3.1.4 Exit Signs

NFPA 101. Wire exit signs and emergency lighting units ahead of the local switch, to the normal lighting circuit located in the same room or area.

Connect exit signs on separate circuits and serve from a separate circuit breaker. Provide only one source of control, which would be the separate circuit breaker. Paint source of control red and provide lockout capability.

3.1.5 Lighting Controls

Refer below for additional lighting control installation requirements.

3.1.5.1 Occupancy/Vacancy Sensors

a. Provide quantity of sensor units indicated as a minimum. Provide additional units to give full coverage over controlled area. Full coverage must provide hand and arm motion detection for office and administration type areas and walking motion for industrial areas, warehouses, storage rooms and hallways.

b. Locate ceiling-mounted sensors no closer than 6 feet from the nearest HVAC supply or return diffuser.

c. Locate the sensor(s) as indicated and in accordance with the manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

3.2.1 Tests

3.2.1.1 Lighting Control Verification Tests

Verify lighting control system and devices operate according to approved sequence of operations. Verification tests are to be completed after commissioning.

a. Verify occupancy/vacancy sensors operate as described in sequence of operations. Provide testing of sensor coverage, sensitivity, and time-out settings in all spaces where sensors are placed. This is to be completed only after all furnishings have been installed. Submit occupancy/vacancy sensor verification test.
b. Verify wall box dimmers and scene wallstations operate as described in sequence of operations.

3.2.1.2 Emergency Lighting Test

Interrupt power supply to demonstrate proper operation of emergency lighting. If adjustments are made to the lighting system, re-test system to show compliance with standards.

3.3 CLOSEOUT ACTIVITIES

3.3.1 Commissioning

NFPA 101. Commission all components of the lighting system and lighting control system in accordance with Section 01 91 00.15 20 TOTAL BUILDING COMMISSIONING. Factory Trained Field Service Technician is responsible for calibration and programming sequences for input devices and systems in accordance with the requirements described in the sequence of operation.

-- End of Section --

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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.

ASTM INTERNATIONAL (ASTM)

ASTM D709	(2017) Standard Specification for Laminated Thermosetting Materials

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

ECIA EIA/ECA 310-E	(2005) Cabinets, Racks, Panels, and Associated Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-83-596	(2021) Indoor Optical Cable
ICEA S-90-661	(2021) Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communications Wiring Systems

NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA/BICSI 568	(2006) Standard for Installing Building Telecommunications Cabling

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA WC 66	(2019) Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pairs

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-455-21	(1988a; R 2012) FOTP-21 - Mating Durability of Fiber Optic Interconnecting

	Devices
TIA-526-7	(2015a; R 2022) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 edition 2: Fibre-Optic Communications Subsystem Test Procedures - Part 4-2: Installed Cable Plant - Single-Mode Attenuation and Optical Return Loss Measurement
TIA-568.0	(2020e) Generic Telecommunications Cabling for Customer Premises
TIA-568.1	(2020e) Commercial Building Telecommunications Infrastructure Standard
TIA-568.2	(2018d) Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-568.3	(2016d; Add 1 2019) Optical Fiber Cabling Components Standard
TIA-569	(2019e) Telecommunications Pathways and Spaces
TIA-606	(2021d) Administration Standard for Telecommunications Infrastructure
TIA-607	(2019d) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA-1152	(2016; R 2021) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
TIA/EIA-598	(2014D; Add 2 2018) Optical Fiber Cable Color Coding
TIA/EIA-604-3	(2004b; R 2014) Fiber Optic Connector Intermateability Standard (FOCIS), Type SC and SC-APC, FOCIS-3
TIA/EIA-604-10	(2002a) FOCIS 10 Fiber Optic Connector Intermateability Standard - Type LC

U.S. FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 68	Connection of Terminal Equipment to the Telephone Network (47 CFR 68)

UNDERWRITERS LABORATORIES (UL)

UL 50	(2015) UL Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations

UL 444	(2017; Reprint Jun 2021) UL Standard for Safety Communications Cables
UL 467	(2022) UL Standard for Safety Grounding and Bonding Equipment
UL 514C	(2014; Reprint Feb 2020) UL Standard for Safety Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 969	(2017; Reprint Mar 2018) UL Standard for Safety Marking and Labeling Systems
UL 1286	(2008; Reprint Apr 2021) UL Standard for Safety Office Furnishings
UL 1666	(2007; Reprint Sep 2021) UL Standard for Safety Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
UL 1863	(2004; Reprint Oct 2019) UL Standard for Safety Communication Circuit Accessories

1.2 RELATED REQUIREMENTS

Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM applies 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 TIA-568.1, TIA-568.2, TIA-568.3, TIA-569, TIA-606 and IEEE 100 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 NFPA 70. 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 SYSTEM DESCRIPTION

The building telecommunications cabling and pathway system shall include permanently installed backbone and horizontal cabling, horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for splicing, terminating, and interconnecting cabling necessary to transport telephone and data (including LAN) between equipment items in a building. The horizontal system shall be wired in a star topology from the telecommunications work area to the floor distributor or campus distributor at the center or hub of the star. The backbone cabling and pathway system includes intrabuilding and interbuilding interconnecting cabling, pathway, and terminal hardware. The intrabuilding backbone provides connectivity from the floor distributors to the building distributors or to the campus distributor and from the building distributors to the campus distributor as required. The backbone system shall be wired in a star topology with the campus distributor at the center or hub of the star. Provide telecommunications pathway systems referenced herein as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. The telecommunications contractor must coordinate with the NMCI/COSC/NGEN contractor concerning access to and configuration of telecommunications spaces. The telecommunications contractor may be required to coordinate work effort within the telecommunications spaces with the NMCI/COSC/NGEN contractor.

1.5 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Telecommunications Drawings

Telecommunications Space Drawings

In addition to Section 01 33 00 SUBMITTAL PROCEDURES, provide shop drawings in accordance with paragraph SHOP DRAWINGS.

SD-03 Product Data

Telecommunications Cabling (backbone and horizontal)

Patch Panels

Telecommunications Outlet/Connector Assemblies

Equipment Support Frame

Connector Blocks

Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Include performance and characteristic curves. Submittals shall also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified in paragraph REGULATORY REQUIREMENTS and as required in Section 01 33 00 SUBMITTAL PROCEDURES.

SD-06 Test Reports

Telecommunications Cabling Testing

SD-07 Certificates

Telecommunications Contractor Qualifications

Key Personnel Qualifications

Manufacturer Qualifications

Test Plan

SD-09 Manufacturer's Field Reports

Factory Reel Tests

SD-10 Operation and Maintenance Data

Telecommunications Cabling and Pathway System Data Package 5

SD-11 Closeout Submittals

Record Documentation

1.6 QUALITY ASSURANCE

1.6.1 Shop Drawings

In exception to Section 01 33 00 SUBMITTAL PROCEDURES, submitted plan drawings shall be a minimum of 11 by 17 inches in size using a minimum scale of 1/8 inch per foot. 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. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

1.6.1.1 Telecommunications Drawings

Provide registered communications distribution designer (RCDD) approved, drawings in accordance with TIA-606. The identifier for each termination and cable shall appear on the drawings. Drawings shall depict final telecommunications installed wiring system infrastructure in accordance with TIA-606. 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. The following drawings shall be provided as a minimum:

a. T1 - Layout of complete building per floor - Building Area/Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways. Layout of complete building per floor. The drawing indicates location of building areas, serving zones, vertical backbone diagrams, telecommunications rooms, access points, pathways, grounding system, and other systems that need to be viewed from the complete building perspective.

b. T2 - Serving Zones/Building Area Drawings - Drop Locations and Cable Identification (ID’S). Shows a building area or serving zone. These drawings show drop locations, telecommunications rooms, access points and detail call outs for common equipment rooms and other congested areas.

c. T4 - Typical Detail Drawings - Faceplate Labeling, Firestopping, Americans with Disabilities Act (ADA), Safety, Department of Transportation (DOT). Detailed drawings of symbols and typicals such as faceplate labeling, faceplate types, faceplate population installation procedures, detail racking, and raceways.

1.6.1.2 Telecommunications Space Drawings

Provide T3 drawings in accordance with TIA-606 that include telecommunications rooms plan views, pathway layout (cable tray, racks, ladder-racks, etc.), mechanical/electrical layout, and cabinet, rack, backboard and wall elevations. Drawings shall show layout of applicable equipment including incoming cable stub or connector blocks, building protector assembly, outgoing cable connector blocks, patch panels and equipment spaces and cabinet/racks. Drawings shall include a complete

list of equipment and material, equipment rack details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation. Drawings may also be an enlargement of a congested area of T1 or T2 drawings.

1.6.2 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.

1.6.2.1 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.

1.6.2.2 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 optical fiber and copper 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.

1.6.2.3 Minimum Manufacturer Qualifications

Cabling, equipment and hardware manufacturers shall have a minimum of 3 years experience in the manufacturing, assembly, and factory testing of components which comply with TIA-568.1, TIA-568.2 and TIA-568.3.

1.6.3 Test Plan

Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 60 days prior to the proposed test date. Include procedures for certification, validation, and testing.

1.6.4 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 NFPA 70 unless more stringent requirements are specified or indicated.

1.6.5 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.

1.6.5.1 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.

1.6.5.2 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.

1.7 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.

1.8 ENVIRONMENTAL REQUIREMENTS

Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, noncondensing.

1.9 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.

1.10 MAINTENANCE

1.10.1 Operation and Maintenance Manuals

Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of the telecommunications cabling and pathway system, Data Package 5. Submit operations and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and as specified herein not later than 2 months prior to the date of beneficial occupancy. In addition to requirements of Data Package 5, include the requirements of paragraphs TELECOMMUNICATIONS DRAWINGS, TELECOMMUNICATIONS SPACE DRAWINGS, and RECORD DOCUMENTATION. Ensure that these drawings and documents depict the as-built configuration.

1.10.2 Record Documentation

Provide T5 drawings including documentation on cables and termination hardware in accordance with TIA-606. T5 drawings shall include schedules to show information for cut-overs and cable plant management, patch panel layouts and cover plate assignments, cross-connect information and connecting terminal layout as a minimum. T5 drawings shall be provided on electronic media using Windows based computer cable management software. Provide the following T5 drawing documentation as a minimum:

a. Cables - A record of installed cable shall be provided in accordance with TIA-606. The cable records shall include only the required data fieldsin accordance with TIA-606. Include manufacture date of cable with submittal.

b. Termination Hardware - A record of installed patch panels, cross-connect points, distribution frames, terminating block arrangements and type, and outlets shall be provided in accordance with TIA-606. Documentation shall include the required data fields as a minimum in accordance with TIA-606.

PART 2 PRODUCTS

2.1 COMPONENTS

Components shall be 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 UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.

2.2 TELECOMMUNICATIONS PATHWAY

Provide telecommunications pathways in accordance with TIA-569 and as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide system furniture pathways in accordance with UL 1286.

2.3 TELECOMMUNICATIONS CABLING

Cabling shall be UL listed for the application and shall comply with TIA-568.0, TIA-568.1, TIA-568.2, TIA-568.3 and NFPA 70. Provide a labeling system for cabling as required by TIA-606 and UL 969. Ship cable on reels or in boxes bearing manufacture date for for unshielded twisted pair (UTP) in accordance with ICEA S-90-661 and optical fiber cables in accordance with ICEA S-83-596 for all cable used on this project. Cabling manufactured more than 12 months prior to date of installation shall not be used.

2.3.1 Backbone Cabling

2.3.1.1 Backbone Copper

Copper backbone cable shall be solid conductor, 24 AWG, 100 ohm, as indicated, but minimum 25 -pair, Category 3, UTP, in accordance with ICEA S-90-661, TIA-568.1, TIA-568.2 and UL 444, formed into 25 pair binder groups covered with a gray thermoplastic jacket. Cable shall be imprinted

with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular length marking intervals in accordance with ICEA S-90-661 . Provide plenum (CMP), riser (CMR), or general purpose (CM or CMG)communications rated cabling in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70.

2.3.1.2 Backbone Optical Fiber

Provide in accordance with ICEA S-83-596, TIA-568.3, UL 1666 and NFPA 70. Cable shall be imprinted with fiber count, fiber type and aggregate length at regular intervals not to exceed 40 inches.

Provide the number of strands indicated, (but not less than 12 strands between the main telecommunication room and each of the other telecommunication rooms), of single-mode(OS1), tight buffered fiber optic cable.

Provide plenum (OFNP), riser (OFNR), or general purpose (OFN or OFNG) rated non-conductive, fiber optic cable in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. The cable cordage jacket, fiber, unit, and group color shall be in accordance with TIA/EIA-598.

Provide plenum (OFNP) riser (OFNR), or general purpose (OFN or OFNG) rated non-conductive, fiber optic cable in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. The cable cordage jacket, fiber, unit, and group color shall be in accordance with TIA/EIA-598.

2.3.2 Horizontal Cabling

Provide horizontal cable in compliance with NFPA 70 and performance characteristics in accordance with TIA-568.1.

2.3.2.1 Horizontal Copper

Provide horizontal copper cable, UTP, 100 ohm in accordance with TIA-568.2, UL 444, ANSI/NEMA WC 66, ICEA S-90-661. Provide four each individually twisted pair, minimum size 24 AWG conductors, Category 6, with a blue thermoplastic jacket for voice and green jacket for data. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) and length marking at regular intervals in accordance with ICEA S-90-661. Provide plenum (CMP), riser (CMR), or general purpose (CM or CMG) communications rated cabling in accordance with NFPA 70. Substitution of a higher rated cable shall be permitted in accordance with NFPA 70. Cables installed in conduit within and under slabs shall be UL listed and labeled for wet locations in accordance with NFPA 70.

2.4 TELECOMMUNICATIONS SPACES

Provide connecting hardware and termination equipment in the telecommunications entrance facility to facilitate installation as shown on design drawings for terminating and cross-connecting permanent cabling. Provide telecommunications interconnecting hardware color coding in accordance with TIA-606.

2.4.1 Backboards

Provide void-free, interior grade A-C plywood 3/4 inch thick 4 by 8 feet . Backboards shall be fire rated by manufacturing process. Fire stamp shall be clearly visible. Backboards shall be provided on a minimum of two adjacent walls in the telecommunication spaces.

2.4.2 Equipment Support Frame

Provide in accordance with ECIA EIA/ECA 310-E and UL 50.

d. Cabinets, wall-mounted modular type, 16 gauge steel construction, minimum, treated to resist corrosion. Cabinet shall have have lockable front door, louvered side panels, ground lug, and top and bottom cable access. Cabinet shall be compatible with 19 inches panel mounting. A surge protected power strip with 6 duplex 20 amp receptacles shall be provided within the cabinet.

2.4.3 Connector Blocks

Provide insulation displacement connector (IDC) Type 110 for Category 6 systems. Provide blocks for the number of horizontal and backbone cables terminated on the block plus 25 percent spare. Connectors must be, non-keyed, non-proprietary, universal keystone, 8P8C jacks terminated on 110 IDC from rear and color coded for both T568A and T568B wiring. Connectors must be color matched to network type.

2.4.4 Cable Guides

Provide cable guides specifically manufactured for the purpose of routing cables, wires and patch cords horizontally and vertically on 19 inches equipment cabinets and telecommunications backboards. Cable guides of ring or bracket type devices mounted on cabinet panelsbackboard for horizontal cable management and individually mounted for vertical cable management. Mount cable guides with screws, or nuts and lockwashers.

2.4.5 Patch Panels

Provide ports for the number of horizontal and backbone cables terminated on the panel plus 25 percent spare. Provide pre-connectorized optical fiber and copper patch cords for patch panels. Provide patch cords, as complete assemblies, with matching connectors as specified. Provide fiber optic patch cables with crossover orientation in accordance with TIA-568.3. Patch cords shall meet minimum performance requirements specified in TIA-568.1, TIA-568.2 and TIA-568.3 for cables, cable length and hardware specified.

2.4.5.1 Modular to 110 Block Patch Panel

Provide in accordance with TIA-568.1 and TIA-568.2. Panels shall be third party verified and shall comply with EIA/TIA Category 6 requirements. Panel shall be constructed of 0.09 inches minimum aluminum and shall be cabinet mounted and compatible with an ECIA EIA/ECA 310-E 19 inches equipment cabinet. Connectors must be, non-keyed, non-proprietary, universal keystone, 8P8C jacks terminated on 110 IDC from rear and color coded for both T568A and T568B wiring. Connectors must be color matched to network type. Connectors must be wired to T568A standard. The rear of each panel shall have incoming cable strain-relief and routing guides. Panels

shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.

2.4.5.2 Fiber Optic Patch Panel

Provide panel for maintenance and cross-connecting of optical fiber cables. Panel shall be constructed of 16 gauge steel minimum and shall be cabinet mounted and compatible with a ECIA EIA/ECA 310-E 19 inches equipment rack. Each panel shall provide 12 single-mode factory polished UPC mechanical connectors as duplex SC in accordance with TIA/EIA-604-3 with zirconia ceramic alignment sleeves. Provide dust cover for unused adapters. The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides. Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each adapter.

2.4.6 Optical Fiber Distribution Panel

Cabinet mounted optical fiber distribution panel (OFDP) shall be constructed in accordance with ECIA EIA/ECA 310-E utilizing 16 gauge steel minimum. Panel shall be divided into two sections, distribution and user. Distribution section shall have strain relief, routing guides, splice tray and shall be lockable, user section shall have a cover for patch cord protection. Each panel shall provide 12 single-mode pigtails and adapters. Provide adapters as duplex SC with zirconia ceramic alignment sleeves. Provide dust covers for adapters. Provide patch cords as specified in the paragraph PATCH PANELS.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTOR ASSEMBLIES

2.5.1 Outlet/Connector Copper

Outlet/connectors shall comply with FCC Part 68, TIA-568.1, and TIA-568.2. UTP outlet/connectors shall be UL 1863 listed, non-keyed, 8-pin modular, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with TIA-568.2 Category 6 requirements. Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T568A and T568B wiring. Each outlet/connector shall be wired T568A as indicated. UTP outlet/connectors shall comply with TIA-568.2 for 200 mating cycles.

2.5.2 Optical Fiber Adapters(Couplers)

Provide optical fiber adapters suitable for duplex LC in accordance with TIA/EIA-604-10 with zirconia ceramic alignment sleeves, duplex SC in Accordance with TIA/EIA-604-3 with zirconia ceramic alignment sleeves, as indicated. Provide dust cover for adapters. Optical fiber adapters shall comply with TIA-455-21 for 500 mating cycles.

2.5.3 Optical Fiber Connectors

Provide in accordance with TIA-455-21. Optical fiber connectors shall be duplex LC in accordance with TIA/EIA-604-10 with zirconia ceramic alignment sleeves, duplex SC in accordance with TIA/EIA-604-3 with zirconia ceramic ferrule, epoxyless compatible with 8/125 single-mode fiber. The connectors shall provide a maximum attenuation of 0.3 dB at 850

1300 1310 1550 nm with less than a 0.2 dB change after 500 mating cycles.

2.5.4 Cover Plates

Telecommunications cover plates shall comply with UL 514C, and TIA-568.1, TIA-568.2, TIA-568.3; flush design constructed of high impact thermoplastic material to match color of receptacle/switch cover plates specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide labeling in accordance with the paragraph LABELING in this section.

2.6 TERMINAL CABINETS

Construct of zinc-coated sheet steel, 36 by 24 by 6 inches deep. Trim shall be fitted with hinged door and locking latch. Doors shall be maximum size openings to box interiors. Boxes shall be provided with 5/8 inch backboard with two-coat varnish finish. Match trim, hardware, doors, and finishes with panelboards. Provide label and identification systems for telecommunications wiring and components consistent with TIA-606.

2.7 GROUNDING AND BONDING PRODUCTS

Provide in accordance with UL 467, TIA-607, and NFPA 70. Components shall be identified as required by TIA-606. Provide ground rods, bonding conductors, and grounding busbars as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.8 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.

2.9 FIELD FABRICATED NAMEPLATES

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inches thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inches high normal block style.

2.10 TESTS, INSPECTIONS, AND VERIFICATIONS

2.10.1 Factory Reel Tests

Provide documentation of the testing and verification actions taken by manufacturer to confirm compliance with TIA-568.1, TIA-568.2, TIA-568.3, TIA-526-7 for single mode optical fiber cables.

PART 3 EXECUTION

3.1 INSTALLATION

Install telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware in accordance with

NECA/BICSI 568, TIA-568.1, TIA-568.2, TIA-568.3, TIA-569, NFPA 70, and UL standards as applicable. Provide cabling in a star topology network. Pathways and outlet boxes shall be installed as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Install telecommunications cabling with copper media in accordance with the following criteria to avoid potential electromagnetic interference between power and telecommunications equipment. The interference ceiling shall not exceed 3.0 volts per meter measured over the usable bandwidth of the telecommunications cabling.

3.1.1 Cabling

Install UTP, and optical fiber telecommunications cabling system as detailed in TIA-568.1, TIA-568.2, TIA-568.3. Screw terminals shall not be used except where specifically indicated on plans. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not exceed manufacturers' cable pull tensions for copper and optical fiber cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable, bend radii shall not be less than four times the cable diameter. Cables shall be terminated; no cable shall contain unterminated elements. Cables shall not be spliced. Label cabling in accordance with paragraph LABELING in this section.

3.1.1.1 Backbone Cable

a. Copper Backbone Cable. Install intrabuilding backbone copper cable, in indicated pathways, between the campus distributor, located in the telecommunications entrance facility or room, the building distributors and the floor distributors located in telecommunications rooms and telecommunications equipment rooms as indicated on drawings.

b. Optical fiber Backbone Cable. Install intrabuilding backbone optical fiber in indicated pathways. Do not exceed manufacturer's recommended bending radii and pull tension. Prepare cable for pulling by cutting outer jacket 10 inches leaving strength members exposed for approximately 10 inches. Twist strength members together and attach to pulling eye. Vertical cable support intervals shall be in accordance with manufacturer's recommendations.

3.1.1.2 Horizontal Cabling

Install horizontal cabling as indicated on drawings Do not untwist Category 6 UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide slack cable in the form of a figure eight (not a service loop) on each end of the cable, 10 feet in the telecommunications room, and 12 inches in the work area outlet.

3.1.2 Pathway Installations

Provide in accordance with TIA-569 and NFPA 70. Provide building pathway as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.1.3 Service Entrance Conduit, Underground

Provide service entrance underground as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.1.4 Cable Tray Installation

Install cable tray as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Only CMP and OFNP type cable shall be installed in a plenum.

3.1.5 Work Area Outlets

3.1.5.1 Terminations

Terminate UTP cable in accordance with TIA-568.1, TIA-568.2 and wiring configuration as specified. Terminate fiber optic cables in accordance with TIA-568.3.

3.1.5.2 Cover Plates

As a minimum, each outlet/connector shall be labeled as to its function and a unique number to identify cable link in accordance with the paragraph LABELING in this section.

3.1.5.3 Cables

Unshielded twisted pair and fiber optic cables shall have a minimum of 12 inches of slack cable loosely coiled into the telecommunications outlet boxes. Minimum manufacturer's bend radius for each type of cable shall not be exceeded.

3.1.5.4 Pull Cords

Pull cords shall be installed in conduit serving telecommunications outlets that do not have cable installed.

3.1.6 Telecommunications Space Termination

Install termination hardware required for Category 6 and optical fiber system. An insulation displacement tool shall be used for terminating copper cable to insulation displacement connectors.

3.1.6.1 Connector Blocks

Connector blocks shall be cabinetwall mounted in orderly rows and columns. Adequate vertical and horizontal wire routing areas shall be provided between groups of blocks. Install in accordance with industry standard wire routing guides in accordance with TIA-569.

3.1.6.2 Patch Panels

Patch panels shall be mounted in equipment cabinetson the plywood backboard with sufficient ports to accommodate the installed cable plant plus 25 percent spares.

a. Copper Patch Panel. Copper cable entering a patch panel shall be secured to the panel with cable tiesas recommended by the manufacturer to prevent movement of the cable.

b. Fiber Optic Patch Panel. Fiber optic cable loop shall be 3 feet in lengthprovided as recommended by the manufacturer. The outer jacket of each cable entering a patch panel shall be secured to the panel to prevent movement of the fibers within the panel, using clamps or

brackets specifically manufactured for that purpose.

3.1.6.3 Equipment Support Frames

Install in accordance with TIA-569:

d. Cabinets, wall-mounted modular type. Mount cabinet to plywood backboard in accordance with manufacturer's recommendations. Mount cabinet so height of highest panel does not exceed 78 inches above floor.

3.1.7 Electrical Penetrations

Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings.

3.1.8 Grounding and Bonding

Provide in accordance with TIA-607, NFPA 70 and as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.2 LABELING

3.2.1 Labels

Provide labeling in accordance with TIA-606. Handwritten labeling is unacceptable. Stenciled lettering for voice and data circuits shall be provided using laser printer .

3.2.2 Cable

Cables shall be labeled using color labels on both ends with identifiers in accordance with TIA-606.

3.2.3 Termination Hardware

Workstation outlets and patch panel connections shall be labeled using color coded labels with identifiers in accordance with TIA-606.

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.

3.3.1 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.

3.4 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.

3.5 TESTING

3.5.1 Telecommunications Cabling Testing

Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA-568.1, TIA-568.2, TIA-568.3. Test equipment shall conform to TIA-1152. Perform optical fiber field inspection tests via attenuation measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon attenuation test failure.

3.5.1.1 Inspection

Visually inspect UTP and optical fiber jacket materials for UL or third party certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for T568A or T568B pin assignments, and inspect cabling connections to confirm compliance with TIA-568.1, TIA-568.2, TIA-568.3, . Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.

3.5.1.2 Verification Tests

UTP backbone copper cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield, if cable has overall shield. Test operation of shorting bars in connection blocks. Test cables after termination but prior to being cross-connected.

3.5.1.3 Performance Tests

Perform testing for each outlet and MUTOA as follows:

a. Perform Category 6 link tests in accordance with TIA-568.1 and TIA-568.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.

b. Optical fiber Links. Perform optical fiber end-to-end link tests in accordance with TIA-568.3.

3.5.1.4 Final Verification Tests

Perform verification tests for UTP and optical fiber systems after the complete telecommunications cabling and workstation outlet/connectors are installed.

a. Voice Tests. These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and DSN telephone call.

b. Data Tests. These tests assume the Information Technology Staff has a network installed and are available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

-- End of Section --

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SECTION 28 31 76

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	(2009; R 2014) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

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; ERTA 1 2024; TIA 24-1) National Electrical Code
NFPA 72	(2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code
NFPA 90A	(2024) 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	(2010) Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems

UNDERWRITERS LABORATORIES (UL)

UL 268	(2016; Reprint Oct 2019) 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 Dec 2012) Protectors for Data Communication 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) 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	UL Product IQ (updated online) at https://productiq.ulpropsector.com/en

1.2 RELATED SECTIONS

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 system complete and ready for operation. Existing interior fire alarm system was manufactured by Notifier.

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.c. Each remote fire alarm control unit must be powered from a wiring riser specifically for that use or from a local emergency power panel located on the same floor as the remote fire alarm control unit. Where remote fire control units are provided, equipment for notification appliances may be located in the remote fire alarm control units.

c. 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)

The QFPE in this section is the same as FPQC in Section 01 45 00. Wherever "Qualified Fire Protection Engineer (QFPE)" or "QFPE" appears in this section, substitute with "Fire Protection Quality Control Specialist (FPQC)". 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.

1.5 SUBMITTALS

Government approval is required for all submittals.

Shop drawings (SD-02), product data (SD-03) and calculations (SD-05) must be prepared by the fire alarm 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 registered professional engineer stamp and signature. 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);

Fire alarm system designer;

Supervisor;

Technician;

Installer;

Test Technician;

Fire Alarm System Site-Specific Software Acknowledgement;

SD-02 Shop Drawings

Nameplates;

Instructions;

Wiring Diagrams;

System Layout;

Notification Appliances;

Initiating devices;

Amplifiers;

Battery Power;

Voltage Drop Calculations;

SD-03 Product Data

Fire Alarm and Mass Notification Control Unit (FMCU);

Local Operating Console (LOC);

Amplifiers;

Tone Generators;

Digitalized voice generators;

LCD Annunciator;

Manual Stations;

Smoke Detectors; Duct Smoke Detectors;

Addressable Interface Devices;

Addressable Control Modules;

Isolation Modules;

Notification Appliances;

Batteries;

Battery Chargers;

Supplemental Notification Appliance Circuit Panels;

Auxiliary Power Supply Panels;

Surge Protective Devices;

Alarm Wiring;

Back Boxes and Conduit;

Ceiling Bridges for Ceiling-Mounted Appliances;

Terminal Cabinets; Environmental Enclosures or Guards;

Document Storage Cabinet;

SD-06 Test Reports

Test Procedures;

SD-07 Certificates

Verification of Compliant Installation;

Request for Government Final Test;

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions;

Instruction of Government Employees;

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, fire reporting system, air handler shutdown 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, 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, and on the remote annunciator.

(3) Actuation of alarm notification appliances.

(4) Recording of the event electronically in the history log of the FMCU.

m. A supervisory signal must automatically initiate the following functions:

(1) Visual indication of the device operated on the FMCU, and on the remote annunciator.

(2) Transmission of a supervisory signal to the fire department.

(3) 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.

(4) 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, and on the remote annunciator.

(2) Transmission of a trouble signal to the fire department.

(3) Recording of the event electronically in the history log of the FMCU.

o. 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.

p. Activation of a LOC pushbutton must activate the audible and visual alarms in the facility. The audible message must be the one associated with the pushbutton activated.

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 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 manufactured by Notifier.

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

Six 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

Six 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

Six 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" as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.

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 IV (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

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

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.

c. One manual station.

d. Two of each type of detector installed.

e. Two of each type of detector base and head installed.

f. Two of each type of audible and visual alarm device installed.

g. Two of each type of addressable monitor module installed.

h. Two of each type of addressable control module installed.

i. 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 FIRE ALARM AND MASS NOTIFICATION CONTROL UNIT

Provide a complete fire alarm and mass notification control unit (FMCU) fully enclosed in a lockable steel cabinet as specified herein. Operations required for testing or for normal care, maintenance, and use of the system must be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control unit, the unit cabinets must match exactly. The system must be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as waterflow switches, valve supervisory switches, fire pump monitoring, independent smoke detection systems, relays for output function actuation.

a. Each control unit must provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit must be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each control unit with supervisory functions for power failure, internal component placement, and operation.

b. Visual indication of alarm, supervisory, or trouble initiation on the FMCU must be by liquid crystal display or similar means with a minimum of 80 characters. The mass notification control unit must have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice messages.

c. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least eight prerecorded messages. Provide the ability to automatically repeat prerecorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, initiate/synchronize strobes and initiate textual visual notification appliances. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.

2.3.1 Cabinet

Install control unit components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of control units as well as field wiring. The cabinet must be a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and semi-recessed mounting provisions. The enclosure must be identified by an engraved phenolic resin nameplate. Lettering on the nameplate must say "Fire Alarm and Mass Notification control unit" and must not be less than 1-inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches.

2.3.2 Silencing Switches

2.3.2.1 Alarm Silencing Switch

Provide an alarm silencing switch at the FMCU that must silence the audible and visual notification appliances. Subsequent activation of initiating devices must cause the notification appliances to re-activate.

2.3.2.2 Supervisory/Trouble Silencing Switch

Provide supervisory and trouble silencing switch(es) that must silence the audible trouble and supervisory signal(s), but not extinguish the visual indicator. This switch must be overridden upon activation of a subsequent supervisory or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated if the supervisory or trouble condition still exists.

2.3.3 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Initiating devices must be manually reset by switch from the FMCU after the initiating device or devices have been restored to normal.

2.3.4 Audible Notification System

The Audible Notification System must comply with the requirements of NFPA 72 for Emergency Voice/Alarm Communications System requirements, except as specified herein. The system must be a one-way, multi-channel voice notification system incorporating user selectability of a minimum eight distinct sounds for tone signaling, and the incorporation of a voice module for delivery of recorded messages. Audible appliances must produce a three-pulse temporal pattern for three cycles followed by a voice message that is repeated until the control unit is reset or silenced. Automatic messages must be broadcast through speakers throughout the building/facility but not in stairs or elevator cabs. A live voice message must override the automatic audible output through use of a microphone input at the control unit or the LOC.

a. When using the microphone, live messages must be broadcast selectable by zone, or all call. The system must be capable of operating all speakers at the same time.

b. The microprocessor must actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative must automatically cause the three-pulse temporal pattern to take over all functions assigned to the failed unit in the event an alarm is activated.

2.3.4.1 Outputs and Operational Modules

All outputs and operational modules must be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form "C" contacts for system alarm and trouble conditions. Provide circuits for operation of auxiliary appliance during trouble conditions. During a Mass Notification event, the control unit must not generate nor cause any trouble alarms to

be generated with the Fire Alarm system.

2.3.4.2 Mass Notification

a. The system must have the capability of utilizing an LOC with redundant controls of the FMCU. Notification Appliance Circuits (NAC) must be provided for the activation of strobe appliances. Audio output must be selectable for line level. A hand-held microphone must be provided and, upon activation, must take priority over any tone signal, recorded message or PA microphone operation in progress, while maintaining the strobe NAC circuit activation.

b. The Mass Notification functions must override the manual or automatic fire alarm notification. Other fire alarm functions including transmission of a signal(s) to the fire department must remain operational. When a mass notification announcement is disengaged and a fire alarm condition still exists, the audible and visual notification appliances must resume activation for alarm conditions. The fire alarm message must be of lower priority that all other messages (except any "test" messages) and must not override any other messages.

c. Messages must be recorded professionally utilizing standard industry methods, in a professional female voice. Message and tone volumes must both be at the same decibel level. Messages recorded from the system microphone must not be accepted. A 1000 Hz tone (as required by NFPA 72) must precede messages and be similar to the following unless Installation or Facility specific messages are required:

(1) Fire: "May I have your attention please. May I have your attention please. A fire emergency has been reported in the building. Please leave the building by the nearest exit." (Provide a 2 second pause.) "May I have your attention please, (repeat the tones and message on a continuous loop)."

(2) Test: "May I have your attention please. May I have your attention please. This is a test of the building mass notification system. Please continue your normal duties. This is only a test." (Provide a 2 second pause.)

(3) All Clear: "May I have your attention please. May I have your attention please. An all clear has been issued, resume normal activities." (Provide a 2 second pause.)

2.3.4.3 Installation-Wide Control

If an installation-wide control system for mass notification exists on the Base, the autonomous control unit must communicate with the central control unit of the Installation-wide system. The autonomous control unit must receive commands/messages from the central control unit and provide status information.

2.3.5 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices must not be considered as equal to non-volatile processors, PROMS, or EPROMS.

2.3.6 Field Programmability

Provide control units and control units that are fully field programmable for both input and output of control, initiation, notification, supervisory, and trouble functions. The system program configuration must be menu driven. System changes must be password protected. Any proprietary equipment and proprietary software needed by qualified technicians to implement future changes to the fire alarm system must be provided as part of this contract.

2.3.7 Input/Output Modifications

The FMCU must contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features must consist of a control unit mounted keypad. Any bypass or modification to the system must indicate a trouble condition on the FMCU.

2.3.8 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

2.3.9 Walk Test

The FMCU must have a walk test feature. When using this feature, operation of initiating devices must result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated in the history log, but no other outputs occur.

2.3.10 History Logging

The control unit must have the ability to store a minimum of 400 events in a log. These events must be stored in a battery-protected memory and must remain in the memory until the memory is downloaded or cleared manually. Resetting of the control unit must not clear the memory.

2.3.11 Manual Access

An operator at the control unit, having a proper access level, must have the capability to manually access the following information for each initiating device.

a. Primary status.

b. Device type.

c. Present average value.

d. Present sensitivity selected.

e. Detector range (normal, dirty).

2.4 LOCAL OPERATING CONSOLES (LOC)

2.4.1 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.

2.5 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.

2.5.1 Operation

The system must automatically operate and control all building speakers.

2.5.2 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.

2.5.3 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.

2.5.4 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.

2.5.5 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.

2.6 REMOTE ANNUNCIATOR

2.6.1 LCD Annunciator

Provide a flush mounted annunciator that includes an LCD display. The display must indicate the device in trouble/alarm or any supervisory

device. Display the device name, address. The remote annunciator must duplicate functions of the FMCU for message display, fire alarm, supervisory alarm, and trouble conditions, visual and audible notification, and system reset functions. Remote annunciator must require the use of a key for accessing the reset, control and other functions.

A building floor plan must be provided and mounted (behind Plexiglass or similar protective material) at the annunciator location. The floor plan must indicate all rooms by name and number including the locations of stairs and elevators. The floor plan must show all devices and their programmed address to facilitate identification of their physical location from the LCD display information.

2.7 MANUAL STATIONS

Provide metal or plastic, semi-flush mounted, double-action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations must be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations must be finished in red with molded raised lettering operating instructions of contrasting color. The use of a key must be required to reset the station.

2.8 SMOKE DETECTORS

2.8.1 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 listed for use with the FMCU.

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 baseswith sounder that produces a minimum of 90 dBA at 10 feet where applicable 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.

2.8.2 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. It is not permitted to cut the duct insulation to install the duct

detector directly on 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 specified in Section 23 09 00 to INSTRUMENTATION AND CONTROL FOR HVAC. Auxiliary contacts provide for this function must be located within 3 feet of the controlled circuit or appliance. The auxiliary contacts must be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

2.9 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. Modules must be listed for the environmental conditions in which they will be installed.

2.10 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.

2.11 ISOLATION MODULES

a. Provide isolation modules to subdivide each signaling line circuit into groups of not more than 20 addressable devices between adjacent

isolation modules.

b. Isolation modules must provide short circuit isolation for signaling line circuit wiring.

c. Power and communications must be supplied by the SLC and must report faults to the FMCU.

d. After the wiring fault is repaired, the fault isolation modules must test the lines and automatically restore the connection.

2.12 NOTIFICATION APPLIANCES

2.12.1 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.

2.12.1.1 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 4-inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single 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 16 gage 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.

d. Addressable notification appliances are prohibited.

2.12.2 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

semi-flush mounted.

2.13 ELECTRIC POWER

2.13.1 Primary Power

Power must be 120 VAC 60 Hz service for the FMCU from the AC service to the building in accordance with NFPA 72.

2.14 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.

2.14.1 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.

2.14.1.1 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.

2.14.1.2 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.

2.14.2 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.

2.15 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.

2.16 WIRING

Provide wiring materials under this section as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein.

2.16.1 Alarm Wiring

IDC and SLC wiring must be fiber optic or solid copper cable in accordance with the manufacturers requirements. Copper signaling line circuits and initiating device circuit field wiring must be No. 18 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. 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.

2.17 SYSTEM MONITORING

2.17.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler 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.

2.18 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.

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 Fire Alarm and Mass Notification Control Unit (FMCU)

Locate the FMCU where indicated on the drawings. Semi-recess the enclosure with the top of the cabinet 6 feet above the finished floor or center the cabinet at 5 feet, whichever is lower. Conductor terminations must be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection must be permanently mounted in the FMCU. Locate the document storage cabinet adjacent to the FMCU unless the Contracting Officer directs otherwise.

3.2.2 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 12 inches above finished floor, measured to the bottom of the cabinet, nor higher than 36 inches 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 1-inch high.

3.2.3 Manual Stations

Locate manual stations as required by NFPA 72 and as indicated on the drawings. Mount stations so they are located no farther than 5 feet from the exit door they serve, measured horizontally. Manual stations must be mounted at 44 inches measured to the operating handle.

3.2.4 Notification Appliances

a. Locate notification appliance devices where indicated 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 2 inches.

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.

3.2.5 Smoke and Heat Detectors

Locate detectors as indicated on the drawings on a 4-inch mounting box. Smoke detectors are permitted to be on the wall no lower than 12 inches from the ceiling with no minimum distance from the ceiling. Install smoke detectors no closer than 3 feet from air handling supply diffusers. Detectors installed in acoustical ceiling tiles must be centered in the tiles plus or minus 2 inches.

3.2.6 LCD REMOTE Annunciator

Locate the LCD annunciator as shown on the drawings. Mount the annunciator, with the top 6 feet above the finished floor or center the annunciator at 5 feet, whichever is lower.

3.2.7 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 4 feet above the floor and the bottom (lowest) message button and microphone is at least 3 feet above the finished floor.

3.2.8 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 8 inches by 8 inches. Only screw-type terminals are permitted. Provide an identification label, that displays "FIRE ALARM TERMINAL CABINET" with 2-inch 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.

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 3/4-inch 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 6 feet 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 DISCONNECTION AND REMOVAL OF EXISTING SYSTEM

Maintain existing fire alarm/mass notification equipment fully operational until the new equipment has been tested and accepted by the Contracting Officer. As new equipment is installed, label it "NOT IN SERVICE" until the new equipment is accepted. Once the new system is completed, tested, and accepted by the Government, it must be placed in service and connected to the supervising station. Remove tags from new equipment and tag the existing equipment "NOT IN SERVICE" until removed from the building.

a. After acceptance of the new system by the Contracting Officer, remove existing equipment not connected to the new system, remove unused exposed conduit, and restore damaged surfaces. Remove the material from the site and dispose.

b. Disconnect and remove the existing fire alarm/mass notification and smoke detection systems where indicated and elsewhere in the specification.

c. Control units and fire alarm devices and appliances disconnected and removed must be turned over to the Contracting Officer.

d. Properly dispose of fire alarm outlet and junction boxes, wiring, conduit, supports, and other such items.

3.5 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 00.00 22 FIRESTOPPING.

3.6 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 3/4-inch wide at 10-foot centers and at each side of a floor, wall, or ceiling penetration.

c. Painting must comply with Section 09 90 00 PAINTS AND COATINGS.

3.7 FIELD QUALITY CONTROL

3.7.1 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.

3.7.2 Pre-Government Testing

3.7.2.1 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.

3.7.2.2 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 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.

3.7.3 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.

3.7.4 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 Engineer, 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.

3.8 MINIMUM SYSTEM TESTS

3.8.1 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.

e. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.

f. 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.

g. Determine that the system is operable under trouble conditions as specified.

h. Visually inspect wiring.

i. Test the battery charger and batteries.

j. 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.

k. Verify that red-line drawings are accurate.

l. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.

m. Measure voltage readings for circuits to ensure that voltage drop is not excessive.

n. 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.

o. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.

p. 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".

3.8.2 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.

3.8.3 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 .7. 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 33 feet 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 50 feet 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 12 inches 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.

3.9 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.

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.

3.10 INSTRUCTION OF GOVERNMENT EMPLOYEES

3.10.1 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.

3.10.2 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.

3.10.2.1 Technical Training

Equipment manufacturer or a factory representative must provide 1 day of on site. Training must allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises.

3.10.3 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.

3.11 EXTRA MATERIALS

3.11.1 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 manufacturer. Installing fire alarm contractor is NOT responsible for any damage resulting from abuse, misuse, or neglect of equipment by the end user.

3.11.2 Spare Parts

Spare parts furnished must be directly interchangeable with the corresponding components of the installed system. 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.

3.11.3 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.

-- End of Section --

SECTION 31 00 00

EARTHWORK
08/23

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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM INTERNATIONAL (ASTM)

ASTM C117	(2023) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D1140	(2017) Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	(2016; E 2019) Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	(2016) Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4318	(2017; E 2018) Standard Test Methods for

	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4829	(2021) Standard Test Method for Expansion Index of Soils
ASTM D5268	(2019) Topsoil Used for Landscaping Purposes
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

1.2 DEFINITIONS

1.2.1 Structural Fill

Soil material placed to support buildings, walls, pads, and other similar facilities.

1.2.2 Topsoil

Surface layer of primarily organic soil capable of supporting vegetation growth.

1.2.3 Utility Bedding Material

Fill placed to directly support pipes, conduits, cables, and appurtenant structures. Bedding may also be used to provide a cushion between utilities and bedrock, obstacles, obstructions, and other unyielding materials.

1.2.4 Satisfactory Materials

Satisfactory materials for fill, backfill, and/or any in-situ soils to remain in place comprise any materials classified by ASTM D2487 as GW, GP and SW. Maximum particle size to be no greater than one-half of the allowable lift thickness in any dimension.

1.2.5 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; roots and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.2.6 Cohesionless Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D4318,

ASTM C117, ASTM C136/C136M and ASTM D1140.

1.2.7 Cohesive Materials

Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when the fines are plastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C117, ASTM C136/C136M and ASTM D1140.

1.2.8 Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 6 inch in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.9 Unstable Material

Unstable materials are too weak to adequately support the utility pipe, conduit, equipment, or appurtenant structure. Satisfactory material may become unstable due to ineffective drainage, dewatering, becoming frozen, excessive loading.

1.2.10 Expansive Soils

Expansive soils are defined as soils that have an expansion index greater than 20 when tested in accordance with ASTM D4829.

1.2.11 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.2.12 Capillary Water Barrier

A layer of clean, poorly graded crushed rock, stone, or natural sand or gravel having a high porosity which is 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 a slab.

1.2.13 Degree of Compaction (Proctor)

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 ASTM D1557 abbreviated as a percent of laboratory maximum density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a

percentage of the maximum density in accordance with AASHTO T 180-21 paragraph 1.5, Note 1.

1.2.14 Degree of Compaction (Relative Density)

Degree of compaction required for soils with less than 5 percent passing the No. 200 sieve, is expressed as a relative percentage of the maximum index density/dry unit weight and minimum index density/dry unit weight, obtained by the test procedures in accordance with ASTM D4253 and ASTM D4254, respectively, abbreviated as a percent of laboratory relative density.

1.2.15 Borrow

Soil brought to the project site from an external location for the purposes of project construction.

1.2.16 Subgrade

Earth materials directly below foundations and directly below granular base materials in building slab and pavement areas including shoulders.

1.3 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are as indicated.

b. Pipes or other artificial obstructions, except those indicated, will not be encountered.

ec. Material character is indicated by the boring logs.

fd. Hard materials will not be encountered.

1.4 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Disposition of Surplus Materials

SD-03 Product Data

Geotextile

SD-04 Samples

Geotextile

SD-06 Test Reports

Dewatering Performance Records
Material Test Report

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Structural Fill

Materials classified as GW, GP or SW in accordance with ASTM D2487. Select material type appropriate for the intended purpose.

2.1.2 Topsoil

Material suitable for topsoil obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch 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. Topsoil material will be in accordance with ASTM D5268.

2.2 BURIED WARNING AND IDENTIFICATION MARKERS

Provide polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches 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
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

2.2.1 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 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.2.2 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 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other

means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.2.3 Detection Wire for Non-Metallic Piping

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.3 MATERIAL FOR RIP-RAP

Provide filter fabric and rock conforming to these requirements for construction indicated.

2.3.1 Rock

Provide rock fragments which ensure permanence in the structure and the environment in which it is to be used. Use rock fragments free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. Provide fragments sized such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Provide rock with a minimum specific gravity of 2.50. Do not permit the inclusion of more than trace 1 percent quantities of dirt, sand, clay and rock fines.

2.4 BORROW

Provide borrow materials from sources located outside of Government property meeting the requirements of paragraph STRUCTURAL FILL.

2.5 GEOTEXTILE

Provide a pervious sheet of polyester, nylon, glass, or polypropylene ultraviolet resistant filaments woven, spun bonded, fused, or otherwise manufactured into a non-raveling fabric with uniform thickness and strength.

PART 3 EXECUTION

3.1 PROTECTION

Perform all work specified in accordance with applicable requirements of the Corps of Engineers publication EM 385-1-1 Safety and Health Requirements Manual.

Use equipment of type and size appropriate for the site conditions (soil character and moisture content). Maintenance of exposed subgrades and fills is the responsibility of the Contractor. The Contractor is required to prevent damage by ineffective drainage, dewatering, and heavy loads and equipment by implementing precautionary measures. Repair or replace any defects or damage.

3.1.1 Underground Utilities

Location of the existing utilities indicated is approximate. Physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor is responsible for protecting utilities from damage during construction.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and provide temporary ditches, swales, and other drainage features and equipment as required to keep soils from becoming unstable, prevent erosion, or undermining of foundations. Remove unstable material from working platforms for equipment operation and soil support for subsequent construction features and provide new material as specified herein. It is the responsibility of the Contractor to assess the site conditions to employ necessary measures to permit construction to proceed.

3.1.2.2 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. French drains, sumps, ditches or trenches are not allowed within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Perform control measures by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, maintain the water level continuously, at least 2 feet below the working level. Operate dewatering system continuously until construction work below existing water levels is complete. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system. Submit dewatering performance records weekly.

3.1.3 Protection of Graded Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.2 BORROW

Select borrow material to meet the requirements and conditions of the fill for which it is to be used. Obtain borrow material from approved private sources. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval.

3.2.1 Contractor Furnished Borrow Area(s)

Obtain approved borrow materials from approved offsite sources. If a

borrow source is selected that is not a commercial entity from which soil material is directly purchased, submit a Borrow Plan that includes the borrow source location, geotechnical test results showing the fill material meets the Contract requirements, environmental test results in accordance with paragraph ENVIRONMENTAL REQUIREMENTS FOR OFF-SITE SOIL, and any Federal, State, and local permits required for excavation and reclamation of the borrow area.

3.2.2 Environmental Requirements for Off-Site Soil

Do not furnish or transport soils onto MCAS Cherry Point or outlying fields when such act would violate the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or the General Statutes of North Carolina.

The Contractor shall provide documentation certifying that all soil furnished under the contract contains no petroleum or hazardous or toxic materials as stated in DoD Instruction 4715.6, which implements 10 U.S.C. 2692. This documentation shall include the Soil Authorization Form (SAF) showing the volume of soil needed, analytical test data to support the environmental condition of the soil, and a copy of the State-issued "mining permit" for the borrow pit source. The MCAS Cherry Point Environmental Affairs Department (EAD) will review these documents before off-site soil is considered approved for use.

The following methods shall be used to determine if soil meets the requirements for off-site soil (RFOSS). If the total amount of soil to be brought onto MCAS Cherry Point for a single contract is less than 200 cubic yards, the Contractor shall certify the soil meets the RFOSS by inspecting for "apparent contamination" as determined by visual or other indications of contamination including abnormal or unnatural color, chemical or petroleum odors, or saturation with a chemical or petroleum. If the soil shows no apparent contamination, the Contractor shall provide to EAD a signed SAF certifying the soil contains no apparent contamination. Soil showing apparent contamination shall not be utilized aboard MCAS Cherry Point or outlying fields.

If the total amount of soil to be brought aboard MCAS Cherry Point for a single contract is equal to or greater than 200 cubic yards, the soil shall be analyzed by a North Carolina certified laboratory. The laboratory must be certified by North Carolina in the specific tests to be performed. Sampling must be conducted by qualified personnel following proper field sampling methodology and proper chain-of-custody protocol must be followed. Otherwise, the sampling will be considered invalid. Consult with the selected laboratory about the specific sample handling procedures required by the analytical methods. Sample containers, sample volumes, and timeframes differ depending on the analytical method.

Sampling requirements are summarized below and are for a single soil source only:

a. One representative sample for soil volumes of 200 cubic yards to 1,000 cubic yards needed.

b. For soil volumes greater than 1,000 cubic yards, one additional representative sample is required for each additional 2,000 cubic yards or portion thereof.

A representative sample is achieved by collecting multiple samples in a

defined area (e.g., soil stockpile or borrow pit) and directing the laboratory to combine them into a "composite sample" for analysis. Thecomposite or representative sample is intended to represent the soil source as a whole.

Samples shall be collected by qualified personnel following proper field sampling methodology. For each representative sample, three "primary samples" from each of two soil borings (or excavation pits) shall be obtained for a total of six primary samples. The three primary samples collected from each boring/pit shall be obtained at even intervals throughout the soil column (i.e., upper, middle, lower) and placed into individual sampling containers. Samples shall not be combined in the field. The six primary samples shall be sent to the NC-certified laboratory where they will be combined into one "composite sample" for analysis.

Soil samples should be analyzed for the following parameters:

a. Gasoline Range Organics - use Standard Method 5030

b. Diesel Range Organics - use Standard Method 5030

c. Oil & Grease - use EPA Method 9071 with a silica gel wash

d. Total Metals - use EPA 6010 (Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, and Silver)

e. Total Metals - use EPA 7471 (Mercury only)

The laboratory method detection limits must be set below the State action levels or the testing will be considered invalid. All units are to be reported in milligrams per kilogram (mg/kg). If test results are greater than the allowed detection limits for petroleum constituents (GRO, DRO, O&G) or the standards for the eight metals (as provided by the EPA), the soil from which the sample was taken shall not be approved for use.

3.2.3 Contaminated Soils

This project is located near or within an area with a history of major POL or chemical spills. Pre-characterization or soil sampling is not required prior to excavation. This information is provided to give the contractor's Industrial Hygiene Department for incorporation into their Health and Safety Plan to ensure worker safety.

All excavated soil that does not exhibit characteristics of contamination and is not from a known AST/UST site may be re-utilized as backfill at the same location. If the soils are from a known AST/UST site and want to be re-used at the same location, then TPH-DRO and TPH-GRO laboratory analysis are required, and results must be below 100 ppm for TPH-DRO and 50 ppm for TPH-GRO. If petroleum contamination is present, cease work and notify EAD.

If any soil which exhibits an abnormal or unnatural color, a chemical or petroleum odor, or is saturated with a chemical or petroleum is encountered during excavation, Contractor shall immediately stop work in that area, and the Contractor shall advise the Environmental Affairs Department (EAD) of the situation so a course of action can be developed to address the contamination. In all cases, EAD, not the contractor, shall make the determination on the proper course of action for waste disposal.

If soil is stockpiled, it shall be stockpiled on plastic, bermed, and covered in accordance with NCDEQ Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater, Vol. 1, dated July 2000 (Guidelines), or placed in a roll-off container and covered with plastic.

Any excess soil that cannot be re-utilized as backfill at the same location from which it was removed shall be disposed at a Subtitle D landfill (e.g., Tuscarora) as a minimum with the understanding that the analytical testing results shall determine the final disposal facility. Contactor shall provide supporting laboratory analysis to the EAD for review. EAD shall review and sign the waste manifests/bill of lading for the soil disposal prior to any of this soil leaving the Air Station. The manifest shall also contain the amount of soil (weight) and supporting laboratory results for EAD to review. One composite sample shall be taken and analyzed for each 200 cubic yards of the stockpile per NCDEQ Guidelines in order to determine the proper method for disposal.

Use of a North Carolina certified laboratory to perform the specific soil analyses is required. The laboratory shall be certified by North Carolina in the specific tests to be performed. Contractor shall consult with the selected laboratory about the specific sample handling procedures required by the analytical methods. Sample containers, volumes, procedures, and preservation vary among methods. Sampling shall be conducted by qualified personnel and proper chain-of-custody protocol shall be followed. The stockpile sample(s) shall be analyzed for the following:

Std Method 5030 sample prep with Modified 8015 (CA GC-FID Method)

Gasoline Range Organics

Std Method 5030 and 3550 sample prep with Modified 8015 - Diesel Range Organics

EPA Method 9071 - Oil & Grease, with silica gel wash

Full TCLP (Toxicity Characteristic Leaching Procedure) including ignitability, corrosivity, and reactivity

PFAS utilizing Draft Method 1633

All disturbed areas shall also be capped topping the excavated area with 12 inches of compacted, clean fill. Capping is required to prevent an increased exposure risk from both surficial exposure and contaminant leaching. Therefore, backfilled soils shall be compacted to minimize infiltration of surface water through the soil column. See 01 14 00 WORK RESTRICTIONS for permitting requirements when excavating into the groundwater table in a Land Use Control (LUC) area.

3.2.4 Contaminated Groundwater

This project is located in a known contaminated area. If dewatering is required during excavation, the groundwater shall not be discharged to the ground surface or storm sewer. The Contracting Officer shall coordinate with the Environmental Affairs Department (EAD).

This project is located in an area with known PFAS contamination. If dewatering is required during excavation, the groundwater shall not be

allowed to discharge to the ground surface or storm sewer. The Contractor shall provide a granular activated carbon/ion exchange groundwater treatment system capable of removing PFAS/PFOA to less than or equal to 70 parts per trillion (ppt). No groundwater discharge resulting from dewatering activities will be allowed without analysis proving treatment limits are met. The contractor must provide adequate holding tank volume until all groundwater is accepted by EAD for discharge. No groundwater discharge will be allowed without approval of the Contracting Officer and Environmental Affairs Department (EAD). NO INCINERATION is allowed at MCAS Cherry Point.

3.3 SURFACE PREPARATION

3.3.1 Clearing and Grubbing

Remove trees, stumps, logs, shrubs, brush, vegetation, and other items that would interfere with construction operations. Remove stumps entirely. Grub out matted roots and roots over 3 inches in diameter to at least 18 inches below existing surface.

3.3.2 Stripping

Strip site where indicated on the plans. Strip existing surface materials to a depth of 6 inches below the existing ground surface in areas designated as Clear and Grub on the plans. Strip existing surficial soils to a depth of 6 inches in all other areas. Strip in all areas within the planned limits of disturbance. All stripped materials not suitable for reuse as topsoil will be wasted in specified disposal area. Screen all stripped soils to remove roots and organic materials prior disposal.

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Protect topsoil and keep in segregated piles until needed.

3.3.3 Proof Rolling

Perform proof rolling on exposed subgrade that is unfrozen and free of surface water (wet conditions resulting from rainfall). Notify the Contracting Officer a minimum of three days prior to proof rolling. Perform proof rolling in the presence of the Contracting Officer.

After stripping, excavating, and rough grading to the planned elevation, proof roll the existing subgrade of all building, pavement, and embankment locations with six passes of a loaded tandem axle dump truck. Operate the roller in a systematic manner to ensure the number of passes over all areas, and at speeds between 2.5 to 3.5 miles per hour. Subgrade materials that exhibit excessive deflection and/or rutting during proof rolling need to be scarified, aerated, and re-compacted to specified density at plus or minus 2 percent of optimum moisture content prior to being considered for remedial action by the Contracting Officer. When proof rolling under buildings, the building subgrade is considered to extend 5 feet beyond the building lines, and make one-half of the passes with the roller in a direction perpendicular to the other passes.

3.3.4 Stockpiling Operations

Place and grade stockpiles of satisfactory and unsatisfactory materials. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by

rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. Do not create stockpiles that could 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. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.4 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Excavate soil disturbed or weakened by Contractor's operations, and soils softened or made unstable for subsequent construction due to exposure to weather. Use material removed from excavations meeting the specified requirements in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes to minimize surplus material and to minimize additional material to be brought on site. Do not excavate below indicated depths except to remove unstable material as determined by the Government and confirmed by the Contracting Officer. Remove and replace excavations below the grades shown with appropriate materials as directed by the Contracting Officer.

If at any time during excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock or as hard/unyielding material, uncover such material, and notify the Contracting Officer. Do not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow sufficient time for classification and delineation of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

3.4.1 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 by the manufacturer. Provide vertical trench walls where no manufacturer installation instructions are available. Do not exceed the trench width of 24 inches below the top pipe plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for pipe sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Government.

3.4.1.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 3 inch or greater in any dimension, or as

recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.4.1.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, notify the Contracting Officer. Following approval, remove such material 24 inch below the required grade and replaced with suitable materials as provided in paragraph FILLING AND COMPACTION.

3.4.1.3 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 suitable material as provided in paragraph FILLING 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.

3.4.1.4 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar 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.

3.4.2 Underground Utilities

Perform work adjacent to utilities in accordance with procedures outlined by utility owner. Excavation made with power-driven equipment is not permitted within 2 feet of known utility or subsurface 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. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.5 SUBGRADE PREPARATION

3.5.1 General Requirements

Shape subgrade to line, grade, and cross section as indicated. Remove unsatisfactory and unstable material in surfaces to receive fill or in excavated areas, as determined by proof rolling, and replaced with structural fill. Do not place material on surfaces that are muddy, frozen, contain frost, or otherwise containing unstable material. Scarify the surface to a depth of 4 inches prior to placing fill. Step or bench sloped surfaces steeper than 1 vertical to 4 horizontal prior to scarifying. Place 4 inches of loose fill and blend with scarified material. When subgrade is part fill and part excavation or natural ground, scarify to a depth of 8 inches.

3.5.2 Subgrade for Pavements

Compact top 12 inches of subgrade for pavements to at least 95 percent of

ASTM D1557. After final rolling, the surface of the subgrade for buildings and pavements must not show deviations greater than 0.05 foot when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area.

3.5.3 Subgrade for Shoulders

Compact the upper 6 inches of subgrade for shoulders to at least 95 percent of ASTM D1557 for the full depth of the shoulder.

3.6 FILLING AND 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 for SUBGRADE PREPARATION. Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Fill and backfill to contours, elevations, and dimensions indicated. Compact and test each lift before placing overlaying lift.

3.6.1 Trench Backfill

3.6.1.1 Final Backfill

3.6.1.1.1 Pavements

Place backfill up to the required elevation as specified. Do not permit water flooding or jetting methods of compaction. Compact as specified for Structural Fill.

3.6.1.1.2 Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 12 inches loose thickness, and compact it to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Apply this requirement to all other areas not specifically designated above.

3.6.2 Structural Fill Placement

Place fill and backfill beneath and adjacent to structures in successive horizontal layers of loose material not more than 8 inches in depth, or in loose layers not more than 4 inches in depth when using hand-operated compaction equipment. Do not place over wet or frozen materials. Compact to at least 90 percent of laboratory maximum density for cohesive materials or 95 percent of laboratory maximum density for cohesionless materials, except as otherwise specified. Perform compaction in such a manner as to prevent wedging action or eccentric loading upon or other damage to the structure. Moisture condition fill and backfill material to within range of plus 2 or minus 2 percent of optimum moisture content at the time of compaction.

3.6.3 Compaction

3.6.3.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5

foot line of the paved area or structure to 85 percent of ASTM D1557.

3.6.3.2 Adjacent Areas

Compact areas within 5 feet of structures to 95 percent of ASTM D1557.

3.7 RIP-RAP CONSTRUCTION

Construct rip-rap on filter fabric in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.7.1 Bedding Placement

Spread filter fabric on prepared subgrade as indicated. Finish bedding to present even surface free from mounds and windrows.

3.7.2 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.8 FINISHING/FINISH OPERATIONS

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, frozen or otherwise unstable subgrade.

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 0.1 foot of the grades and elevations indicated except as indicated 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 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.

3.8.1 Grading Around Structures

Construct areas within 5 feet 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.

3.8.2 Shoulder Construction

Construct shoulders of satisfactory material. Submit advanced notice on shoulder construction for rigid pavements. Construct shoulders immediately after adjacent paving is complete. In the case of rigid pavements, do not construct shoulders until permission of the Contracting Officer has been obtained. Compact the entire shoulder area to at least the percentage of maximum density as specified in paragraph SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Finish shoulder construction in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. Align the completed shoulders true to grade and shaped to drain in conformity with the cross section shown.

3.8.3 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.8.4 Topsoil and Seed

Provide as specified in Section 32 92 23 SODDING.

3.9 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property all surplus or other soil material not required or not suitable for filling or backfilling, along with brush, refuse, stumps, roots, and timber. Properly dispose of in accordance with all applicable laws and regulations. Prepare plan for Disposition of Surplus Materials to include permissions document to dispose of nonsalable products.

3.10 TESTING

Perform testing as indicated in Table 1. Submit Material Test Reports within 7 days of tests being completed.

Material Type list materials to be tested as identified in paragraph DEFINITIONS	Location of Material	Test Method	Test Frequency
Structural Fill	- Excavations - Trench Backfill - Pavement Areas	Density - ASTM D1556/D1556M, ASTM D6938. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M.	One test per 2000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines. Double testing frequency for areas compacted by hand-operated machines. If ASTM D6938 is used, check in-place densities by ASTM D1556/D1556M as follows: One check test per lift for every 6.

Material Type list materials to be tested as identified in paragraph DEFINITIONS	Location of Material	Test Method	Test Frequency
Structural Fill	-Excavations - Trench Backfill -Pavement Areas	Moisture Density Relationship - ASTM D1557	One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density. Sample to be taken from stockpile or location of placement.
Structural Fill	- Excavations - Trench Backfill -Building Areas -Pavement Areas	Gradation - ASTM C136/C136M	One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density. Sample to be taken from stockpile or location of placement.

-- End of Section --

SECTION 32 17 23.16

ROAD AND PARKING LOT PAVEMENT MARKINGS
11/24

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.

ASTM INTERNATIONAL (ASTM)

ASTM D4414	(1995; R 2020) Standard Practice for Measurement of Wet Film Thickness by Notch Gages

MASTER PAINTERS INSTITUTE (MPI)

MPI 97	(2012) Traffic Marking Paint, Latex

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-STD-595A	(2017) Colors used in Government Procurement

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009; Rev 2012) Manual on Uniform Traffic Control Devices

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-1952	(2015; Rev F; Notice 1) Paint, Traffic and Airfield Markings, Waterborne

1.2 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Safety Data Sheets For Each Paint Type

Safety Data Sheets For Chemicals Used In Surface Preparation

Data Sheets For Paint Removal Equipment

Surface Preparation Equipment List

Marking Applications Equipment List

Detour Plans;

SD-03 Product Data

Manufacturer Data Sheets for all Marking Materials

SD-06 Test Reports

Marking Application Wet Film Thickness Test

SD-07 Certificates

Manufacturer Certificate of Compliance for Marking Materials

Manufacturer Certificate of Compliance for Reflective Materials;

Manufacturer Certificate of Conformance for Volatile Organic Compliance

SD-08 Manufacturer's Instructions

Marking Materials Storage and Application

Reflective Media Storage and ApplicationChemicals Used in Surface Preparation

1.3 DELIVERY, STORAGE, AND HANDLING

A conditioned storage and staging area on the installation will be provided for all materials intended to be used on the project. Ensure all materials delivered to the storage location are in the original container and clearly marked with the product name, compliance information, batch number, color, manufactured date, instructions for storage, instructions for application, and the name of the manufacturer. All materials are to be stored in conformance with the manufacturer instructions. Provide manufacturer instructions for; marking materials storage and application, reflective media storage and application, and the chemicals used in surface preparation.

1.4 PROJECT/SITE SPECIAL CONDITIONS

1.4.1 Environmental Requirements

Pavement surface must be free of snow, ice, or slush; with a surface temperature of at least 40 degrees F and rising at the beginning of operations, except those involving shot blasting or grinding. Cease operation during thunderstorms, or during rainfall, except for water blasting and removal of previously applied chemicals. Cease water blasting where surface water accumulation alters the effectiveness of material removal.

1.4.1.1 Weather Limitations for Marking Application

Apply pavement markings to clean, dry surfaces and only when the ambient temperature is at least 5 degrees F above the dew point and the pavement surface temperatures are within the limits recommended by the manufacturer of the material being used unless otherwise noted. Allow the pavement surface to dry after the water has been used for surface preparation or after a precipitation event. Do not perform marking applications when the wind carries overspray onto locations adjacent to the marking. Provide wind screens to shroud application equipment.

1.4.1.2 Testing Dry Surfaces

Do not commence marking until the pavement surface is dry. Use the plastic wrap method as described in paragraph PRE-APPLICATION TESTING to test the pavement surface for moisture. Do not proceed with marking until the Contracting Officer has observed the moisture test and has accepted the area prepared for marking.

1.4.1.3 Volatile Organic Compounds Compliance

Submit a manufacturer certificate stating that the proposed pavement marking paint meets the Volatile Organic Compound (VOC) regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located. Submit manufacturer certificate of conformance for volatile organic compliance.

1.4.2 Traffic Control for Roads and Parking Lots

Place approved signs conforming to MUTCD near the beginning of the worksite and well ahead of the worksite to alert approaching traffic from both directions. Place markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with warning signs that can be read from a distance of 100 feet, indicating slow-moving painting equipment in operation. Provide all lighting and equipment necessary to light the work area during night operations effectively.

When traffic is rerouted or controlled to accomplish the work, provide necessary warning signs, flag persons, and related equipment for the safe passage of vehicles. Submit detour plans to the Contracting Officer for approval before doing the work.

1.5 APPLICATION EQUIPMENT CALIBRATION

Before performing any marking application, calibrate the paint and glass bead application equipment at the necessary speed to execute the application. Calibration and application will be performed using paint that is not diluted or thinned. Paint will be used as formulated by the manufacturer. Calibrate paint and bead guns for each line width and color intended to be applied. Use metal coupons placed in the path of the equipment to capture a test line without glass beads. Use a wet film gauge in accordance with ASTM D4414, to determine if the wet film thickness is the same at each edge and at the center of the marking. Adjust each paint gun to provide a line of uniform thickness.

Collect a sample of glass beads directly from the glass bead dispenser along a measured distance. Weigh the glass beads captured and determine the coverage by dividing the weight by the area of the line placed during the calibration. Adjust the glass bead dispenser to provide an application rate necessary to meet or exceed the reflectivity specified. After determining the application rate, apply a reflective marking using the wet film thickness to be used for the color and marking element. Using a magnifying glass, examine the distribution and embedment of the glass beads. Beads are to be distributed uniformly for the width of the marking. Adjust the wet film thickness if the beads are submerged or predominantly on the surface of the marking.

PART 2 PRODUCTS

2.1 EQUIPMENT

Submit a surface preparation equipment list by serial number, type, model, and manufacturer. Include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation. Mobile equipment must allow for removal of markings without damaging the pavement surface or joint sealant. Maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition.

2.1.1 Surface Preparation and Paint Removal for Roads and Parking Lots

Submit data sheets for paint removal equipment intended for use in preparation of the pavement surface for marking. In the submittal, include descriptive information on the means for adjusting coverage per each pass, water pressure adjustment range, and tank and flow capacities. The equipment must have a range of adjustments that will provide a clean surface free of dirt, dust, oil, grease, algae, mildew, mold, and loose paint. When preparing new portland cement concrete for marking, provide equipment capable of removing curing compounds without damage to the concrete surface and joint seal materials. Submit safety data sheets for chemicals used in surface preparation. Chemicals must be bio-degradable.

2.1.1.1 Water Blasting Equipment

Use mobile water blasting equipment capable of producing a pressurized stream of water that effectively removes paint from the pavement surface without significantly damaging the pavement. Provide equipment, tools, and machinery which are safe and in good working order.

2.1.1.2 Shot Blasting Equipment

Use mobile self-propelled shot blasting equipment capable of producing an adjustable depth of paint removal and propelling abrasive particles at high velocities on the paint for effective removal. Ensure each unit is self-cleaning and self-contained. Use equipment able to confine the abrasive, any dust that is produced, and removed paint and is capable of recycling the abrasive for reuse.

2.1.1.3 Grinding or Scarifying Equipment

Use equipment capable of removing surface contaminates, paint build-up, or extraneous markings from the pavement surface without leaving any residue. Clean the surface by a hydro blast to remove surface contaminants, and ash after a weed torch is used to remove paint.

2.1.1.4 Chemical Removal Equipment

Use chemical equipment capable of applying and removing chemicals and paint from the pavement surface, leaving only non-toxic biodegradable residue without scarring or other damage to the pavement or joints and joint seals.

2.1.2 Markings Application Equipment

Submit a marking applications equipment list of equipment appropriate for the material(s) to be used. Include the manufacturer's descriptive data

and certification for the planned use that indicates the area of coverage per pass, pressure adjustment range, tank and flow capacities, and all safety precautions required for operating and maintaining the equipment. Provide and maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition, or remove equipment that is not providing satisfactory performance from the work site. Provide mobile and maneuverable application equipment to the extent that straight lines can be followed and normal curves can be made in a true arc.

2.1.2.1 Airless or Atomizing Equipment

Provide mobile airless or pneumatic air-atomized application equipment that is maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. Mount equipment on trucks, skids or tractors. Use equipment suitable for application of the marking material specified. Airless systems are used to apply waterborne and epoxy coatings. Pneumatic systems are used only to apply waterborne and solvent based coatings.

Provide equipment capable of applying a marking from 4 inches to 12 inches wide in a single pass and also capable of applying two single solid or intermittent lines using a minimum of two colors. Provide equipment with tanks or reservoirs equipped with mechanical agitators, pressure regulators, and gages in full view of the equipment operator. Use paint strainers suitable to screen paint flowing in all supply lines.

2.1.2.2 Hand-Operated Machines

Provide a hand-operated push-type applicator machine commonly used for the 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, parking lots, or surface painted signs. Provide an applicator machine with the necessary tanks and spraying nozzles capable of applying paint uniformly at specified wet film thickness. Provide spray guns for hand application of paint in areas where push-type machines cannot be used.

2.1.2.3 Reflective Media Dispenser

Mount glass bead dispensers that are automatically triggered when paint guns are activated. The dispensers may be pressurized or gravity-drop systems. Pressurized systems require moisture control.

2.1.3 Preformed Retroreflective Pavement Marking Tape Application Equipment

Provide mechanical application equipment specifically designed for the placement of preformed marking tape. The equipment is specifically designed to apply pressure-sensitive pavement marking tape of varying widths. Equip the applicator with rollers, or other suitable compaction devices to provide initial adhesion of the material with the pavement surface. Use additional tools and devices for properly seating the applied material, as the manufacturer recommends.

2.2 ROAD AND PARKING LOT MATERIALS

Submit safety data sheets for each paint type as well as manufacturer data sheets for all marking materials; include with the submittal a manufacturer certificate of compliance for marking materials and a

manufacturer certificate of compliance for reflective materials.

2.2.1 Marking Colors

Provide markings for pavements that conform to SAE AMS-STD-595A color numbers as listed in Table I.

Table I - SAE AMS-STD-595A Color Numbers	
Paint Color	SAE AMS-STD-595A Color Number
White	37925
Yellow	33538
Black	37038
Green	34108
Red	33411

2.2.2 Waterborne Paint

Use FS TT-P-1952, Type I or II paint.Use MPI 97 paint.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean surfaces before the application of marking materials. Remove all dust, dirt, scaling or loose paint, algae, oils, and grease and mineral deposits such as iron stains by use of water blasting or chemical removal. Follow the cleaning with sweeping, blowing or using water rinse. Do not begin painting in any location prepared for marking until surfaces are dry and clean.

Scrub areas with oil or grease present with applications of trisodium phosphate solution or other approved detergent or degreaser. Rinse thoroughly after each application to prevent staining of the new marking. After cleaning oil-soaked areas, seal with shellac or primer as the manufacturer recommends to prevent bleeding through the new paint.

3.2 PRE-APPLICATION TESTING

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 Contracting Officer has approved the pavement condition.

Employ the plastic wrap method, described as follows, to test the pavement for moisture:

a. Cover the pavement with a 12 inch by 12 inch section of clear plastic wrap and seal the edges with tape.

b. After 15 minutes, examine the plastic wrap for any visible moisture accumulation. Do not begin marking operations until the test can be

performed with no visible moisture accumulation inside the plastic wrap.

c. Re-test surfaces when work has been stopped due to a precipitation event.

3.3 MARKINGS APPLICATION

3.3.1 Marking Materials for Roads and Parking Lots Pavement

3.3.1.1 Waterborne Paint

The dilution or thinning of paint prior to application is not allowed.

Provide FS TT-P-1952 waterborne paint. Apply non-reflective markings in accordance with Table III. Use the paint type as shown on the drawings.

3.4 FIELD QUALITY CONTROL AND ACCEPTANCE

3.4.1 Material Inspection

The Contractor is responsible for examining all materials accepted for delivery for compliance with the certificate of compliance.

3.4.2 Dimensional Tolerance

The Contractor applies layout markings. All layout markings are placed before the marking material application. The edges of a line must not vary from a straight line drawn between the beginning and end of the line more than 1/2-inch to 50 feet. Marking dimensions and spacing must be within the tolerances provided in Table IV.

TABLE IV - Dimensional Tolerance for Marking Elements	
Dimension and Spacing	Tolerance
12 inch or less	+/- 1/2 inch
Greater than 36 inch to 6 feet	+/- 1 inch
Greater than 6 feet to 60 feet	+/- 2 inch
Greater than 60 feet	+/- 3 inch

3.4.3 Coating Application Reporting

3.4.3.1 Wet Film Thickness

Conduct a marking application wet film thickness test. Provide a wet film thickness gauge to measure the wet film thickness using ASTM D4414 at the edge(s) and one interior location of the marking. When more than 3 in 10 consecutive measurements of wet film thickness are outside of the tolerances in Table III, remove and replace areas not meeting the wet film thickness requirement.

3.5 CLEANUP AND WASTE DISPOSAL

The worksite and the material staging area must be free of debris, dirt, and items that will blow away during periods of elevated wind speeds. Dispose of all materials at a site approved by the Contracting Officer. Dispose of waste from cleaning the marking equipment at a facility that is permitted to accept the material.

3.5.1 Cleanup Requirements

Provide a vacuum sweeper after each work area when markings are cured. Vacuum sweep the entire pavement surface to provide a clean pavement without fugitive debris.

-- End of Section --

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.

ASTM INTERNATIONAL (ASTM)

ASTM C602	(2023) Agricultural Liming Materials
ASTM D4972	(2018) Standard Test Methods for pH of Soils

TURFGRASS PRODUCERS INTERNATIONAL (TPI)

TPI GSS	(1995) Guideline Specifications to Turfgrass Sodding

U.S. DEPARTMENT OF AGRICULTURE (USDA)

DOA SSIR 42	(2022) Kellogg Soil Survey Laboratory Methods Manual, Soil Survey Investigations Report, No. 42, Version 6.0

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 applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fertilizer

Include physical characteristics, and recommendations.

SD-06 Test Reports

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

Sod farm certification for sods. Indicate type of sod in accordance with TPI GSS.

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 state and federal laws. Instead of containers, fertilizer may be furnished in bulk with certificate indicating the above information.

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 frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.7 TIME LIMITATIONS

1.7.1 Sod

Place sod a maximum of thirty six hours after initial harvesting, in accordance with TPI GSS as modified herein.

PART 2 PRODUCTS

2.1 SODS

2.1.1 Classification

Centipede sod, nursery grown, certified as classified in the TPI GSS. Machine cut sod at a uniform thickness of 3/4 inch within a tolerance of 1/4 inch, 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. Wood pegs and wire staples for anchorage shall be as recommended by sod supplier.

2.1.2 Purity

Sod species shall be genetically pure, free of weeds, pests, and disease.

2.1.3 Composition

2.1.3.1 Sod Farm Overseeding

At the sod farm provide sod with overseeding of annual rye grass seed.

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 COMPOSITION. When available topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section 31 00 00 EARTHWORK.

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph COMPOSITION. Additional topsoil shall be furnished by the Contractor.

2.2.3 Composition

Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D4972. 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 Lime

Commercial grade hydrate limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C602 of not less than 110 percent.

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.

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 4 inches of off-site topsoil or on-site topsoil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer into soil a minimum depth of 4 inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 3/4 inch 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. For bidding purposes only apply at rates for the following:

Lime 200 pounds per acre.

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 1 inch 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 5/8 inch in any dimension.

3.2.2 Placing

Place sod a maximum of 36 hours after initial harvesting, in accordance with TPI GSS 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 2 feet 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 90 pounds 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 6 inches. 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 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.

-- End of Section --

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