BUILDING 1, CHARLESTOWN NAVY YARD
BOSTON NATIONAL HISTORICAL PARK
PMIS # 154176C

CONSTRUCTION SPECIFICATIONS
September 27, 2024

NATIONAL PARK SERVICE
Boston National Historical Park
21 Second Ave
Charlestown, MA 02129

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(617) 542-6650

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101 Federal Street – Suite 600
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180 Wells Avenue, Suite 200
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SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Work Covered by Contract Documents
2. Work Phases
3. Construction Contractor Use of Site
4. Public Use of Site
5. Occupancy Requirements for Buildings
6. Conduct of Operations
7. Work Restrictions
8. Special Construction Requirements

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location:
Boston National Historical Park - Building 1
21 2nd Ave.
Charlestown Navy Yard
Boston MA 02129

B. The Work consists of:

1. Hazardous material work including interior demolition for asbestos/mold abatement. The spaces will be left in a raw partly demolished “make safe” condition.
2. Utility work including electrical upgrades from 60amp to 200amp service and provision of an additional 200amp service panel for future needs. It does not include new electrical wiring or outlets.
3. Exterior work including site specific brick repointing, all door and window lintel restoration and repairs, repair/replacement of sidewalk canopy, roof repairs, and door replacements. Window repair/replacement, repainting of windows and trim is excluded.

C. Project will be constructed under a single prime contract.

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1.3 CONTRACTOR USE OF SITE

A. General: Contractor shall have partial use of the site for construction operations during the construction period. Contractor's use of the site is limited as indicated on the Drawings and by the Government's right to perform work or to retain other contractors on portions of Project.

B. Storage of Materials: Confine storage of materials to locations designated by park staff. Confine storage of materials, field offices, equipment storage, trailer storage and parking to areas approved by Contracting Officer. Use temporary chain link fence with a lockable gate to define staging areas and at open storage areas containing equipment and supplies. The Government assumes no responsibility for the security of any Contractor equipment, materials, or supplies and such responsibility remains that of the Contractor. Contractor is advised of the spatial limitations of the contractor-use areas and that additional off-site vehicular parking may be required. Storage will not be permitted in existing structures.

C. Preservation of Natural Features:

1. Prevent damage to natural surroundings. Restore damaged areas, at no additional expense to the Government.
2. Do not remove, injure, or destroy trees or other plants without prior approval. Consult with Contracting Officer and remove agreed-on roots and branches that interfere with construction.
3. Do not fasten ropes, cables, or guys to existing trees.
4. Carefully supervise excavating, grading, filling, and other construction operations near trees to prevent damage.

D. Driveways and Entrances: Keep driveways, roadway and entrances serving premises clear and available to Government, Government's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Contractor will use main entrance into Charlestown Navy Yard and park in locations designated by park staff.

1. Schedule deliveries to minimize use of driveways and entrances.
2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

E. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials. Load restrictions on park roads are identical to the state load restrictions with such additional regulations as may be imposed by the Park Superintendent. Information regarding rules and

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regulations for vehicular traffic on park roads may be obtained from the Office of the Park Superintendent. A special permit will not relieve Contractor of liability for damage which may result from moving of equipment.

1.4 SECURITY

A. The Charlestown Navy Yard is a secure facility. All persons and vehicles entering the yard are subject to search by the National Park Service law enforcement personnel. The General Contractor shall furnish a list of all personnel and vehicles (including license plate numbers) anticipated to be on site prior to the start of work and shall update such list as appropriate during the duration of the work.

B. All contractor personnel shall have appropriate identification and shall furnish such identification to authorized National Park Service law enforcement personnel upon request. A current driver's license is required to operate a motor vehicle in the Charlestown Navy Yard.

C. The National Park Service reserves the right to suspend access to the Charlestown Navy Yard in response to changing security levels and conditions.

1.5 PUBLIC USE OF SITE

A. Contractor shall at all times conduct his operations to ensure the least inconvenience to the public. Road closures will not be permitted, without specific approval of Contracting Officer.

1.6 PARKING AND TRANSPORTATION

A. Except for Contractor's vehicles actively employed in the accomplishment of the work, the NPS cannot guarantee the Contractor's employee vehicles can be accommodated within the Charlestown Navy Yard and in no case will overnight parking be permitted. Contractor is urged to encourage workers to carpool or to provide other environmentally responsible modes of transportation to bring workers to the site. Parked vehicles shall not be left running.

1.7 CONDUCT OF OPERATIONS

A. At all times the contractor shall conduct his operations in conformance with the rules and regulations promulgated by the Secretary of the Interior for the National Park Service, and applicable park rules and regulations prescribed by the Park Superintendent.

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B. Work on Saturdays, Sundays, Federal holidays or at night may not be performed without prior consent from the Contracting Officer. Submit requests 72 hours in advance of the work to the Contracting Officer for approval.

C. No signs or advertisements (except those specified herein) shall be displayed on the construction site or within the park unless approved by the Contracting Officer.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 8:00 a.m. to 4:30 p.m., Monday through Friday, except when otherwise indicated.

B. Smoking of and/or use of tobacco or vaping shall be restricted to areas designated and approved by the Park. Contractor to coordinate with and comply with Park guidelines.

1.9 HISTORIC NATURE OF THE WORK

A. Boston Naval Shipyard is a National Historic Landmark. Contractor shall take all necessary precautions to protect the elements of the buildings not scheduled to receive work. Any damage to such elements shall be repaired by the Contractor at no expense to the Government.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 - PRODUCTS (Not Used)

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PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

1. NOT USED

END OF SECTION

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SECTION 012601 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section consists of administrative and procedural requirements for contract modifications.

1.2 DEFINITIONS AND ALLOWANCES

A. Home Office Overhead: Costs incurred in support of all of a contractor's projects and not attributable to a specific job. The cost for home office overhead is only allowed as a percentage of all direct work excluding profit. The following items represent allowable home office overhead costs identified in Part 31 of the Federal Acquisition Regulation (FAR):

1. Rent
2. Utilities
3. Furnishings
4. Office equipment
5. Executive and management staff not exclusively assigned to the project
6. Support, accounting, and administrative staff
7. Preparation of cost proposals, estimating, and schedule analyses connected with Modifications
8. Estimating and preconstruction services
9. Mortgage costs
10. Real estate and corporate taxes
11. Automobile maintenance and travel costs for home office personnel
12. Home office insurances i.e. structure, automotive, umbrella, flood, etc.
13. Depreciation of equipment and other assets
14. Home office supplies (paper, staples, etc.)
15. Legal services
16. Accounting and data processing
17. Professional fees/registration

B. General Conditions (Field Office Overhead): Management and administrative costs incurred on site for the designated project. Costs associated with preparation of modifications will not be allowed. Costs for these items are to be included only in the general conditions of the modification estimate. Only in the case of a contract time extension are additional general

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conditions included in modifications. The following items, if applicable, are considered allowable costs for calculating General Conditions:

1. Project Manager (PM), Assistant Project Manager
2. Superintendent, Assistant Superintendent
3. Quality Control, Safety Officer, Environmental Manager, etc.
4. Engineers
5. Travel, lodging, and per diem (as established by Federal Travel Regulations)
6. Scheduling
7. Field Office Trailers and associated temporary utilities
8. Field office supplies
    a. Mailing and couriers
    b. Reproduction costs
    c. Storage
    d. Phones
    e. Computers
    f. Copiers
9. Personal vehicles i.e. Superintendent Pickup trucks

C. General Requirements: Costs directly associated with the project and are necessary to perform the actual work of the modification. These costs shall be shown as direct costs in the estimate. The following items, if applicable, are considered allowable costs for calculating General Requirements:

1. Hoisting
2. Material handling
3. Temporary fencing
4. Port-a-lets
5. Trash removal, dumpsters
6. Barricades
7. Small tools
8. Safety supplies
9. Scaffolding
10. Daily cleaning
11. Traffic control
12. Temporary signage
13. Temporary heating and power

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D. Personnel Costs: Costs included in the modification must only be for General Conditions staff and workers actually present and working on project site. Modification costs for salaried workers are only allowed within the structure of a 40-hour week and no overtime or holiday pay will be allowed.

1. Worker Hourly Rates are costs directly associated with the individual worker and consist of the following:

a. Base Rate: The hourly rate paid directly to the worker
b. Labor Burden: Employer payments of all applicable burdens; includes insurance and taxes the business must pay on behalf of the worker to government entities and educational forums, such as:

1) Social Security
2) Medicare
3) Workers Compensation – Policy and company calculation to be made available.
4) Federal Unemployment Tax Act (FUTA) - Cap Rate and percentage to be proportionally allocated over one year.
5) State Unemployment Tax Act (SUTA) - Cap Rate and percentage to be proportionally allocated over one year.
6) Union agreement costs - Other costs required under an enforceable collective bargaining agreement.

c. Fringe Benefits: Various non-wage compensations provided to employees such as:

1) Health Care Insurance Premiums
2) Cell Phone
3) Clothing
4) 401K and Pensions
5) Vehicle allowances
6) Gas allowance
7) Life insurance premiums
8) Disability insurance
9) Other Fringe Benefits required under an enforceable collective bargaining agreement

E. Bonuses or Deferred Compensation: No Bonus or Deferred Compensation will be allowed within any components of pricing including Home Office Overhead, General Conditions, General Requirements, Hourly Worker Rates, or the direct costs of work.

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F. General Liability Insurance: An insurance policy that protects Contractor from claims resulting from bodily injury or property damage to a third party. Include as a separate line item within all modification proposals and provide a current insurance quote upon request.

G. Performance and Payment Bonds: A performance bond is a surety bond issued by an insurance company or bank to guarantee satisfactory completion of a project. The Payment Bond guarantees the Contractor will pay the labor and material costs incurred. Banks and Insurance companies charge a premium for individual project based on a sliding scale related to the size of the project. Include as a separate line item in modification proposals and provide current company bonding rates upon request.

H. Builder's Risk Insurance: Covers the contractor's loss due to fire, high winds, or other natural forces. Not reimbursed by the National Park Service (NPS) and shall not be included in modification proposals.

1.3 MODIFICATION PROPOSAL PRICING REQUIREMENTS

A. General:

1. Proposal be received in the format and within the time frame specified in the Request for Proposal (RFP) letter. Costs or delays resulting from failure of contractor to submit within the time frame specified will not be compensable.
2. Proposal shall be detailed with itemized lists of equipment, materials, labor, production rates, overhead, profit, and bond markup for each item. Labor costs must be itemized by craft and hourly rate, including Fringe Benefits and Labor Burden. If the costs of Fringe Benefits and Labor Burden are not itemized, it is assumed they are included in the hourly rate shown, or contractor is not requesting reimbursement. Contractor may utilize the government provided Contractor Estimate Form, or their own form, provided that it contains the same information and level of detail as the Government's form.
3. Requests for extensions of contract time as a result of change must be justified with a Time Impact Analysis (TIA). Refer to Section 01 32 16 "Construction Schedule", for time impact analysis requirements. TIA and associated costs shall be received with the proposal by the date shown within the Request for Proposal letter. Contractor's failure to submit within the specified time frame will be construed as the Contractor waiving right for additional time and no time extension will be allowed.
4. All supporting documentation used to justify the proposed modification will be made available to the Contracting Officer (CO) upon request.
5. Contractor shall review and approve all subcontractor/supplier pricing in detail for proper format, scope, production rates, and pricing prior to submission to NPS. All

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delay costs associated with not reviewing and approving subcontractor/supplier pricing will be borne by the Contractor.

6. All pricing and production rates within the estimate must be based on fair and reasonable pricing and cannot include built-in contingency.

B. Labor:

1. Contractor shall estimate cost of labor by itemizing each craft involved, indicating worker hourly rate (base rate + labor burden + fringe benefits) for each and itemizing hours required for each craft directly engaged in modification work. Any work proposed requiring overtime work or premium pay shall be itemized separately. Rates shall be in accordance with the Davis-Bacon Act as incorporated herein. Labor Burden may include payroll taxes, Social Security, unemployment insurances, workers compensation insurance, Federal Insurance Contributions Act (FICA), FUTA, and other direct costs resulting from Federal, State or local laws.
2. Itemize labor costs for equipment operators separate from equipment costs.
3. Labor cost for foremen shall only be costs for related work required for the modification.

C. Materials:

1. Estimated cost for materials shall include quotes from multiple sources. Material prices shall include applicable fees and credits, including but not limited to, sales tax, freight and delivery charges, and tax rebates.
2. No markup shall be applied to any material provided by NPS.

D. Equipment:

1. Equipment used for the project must be appropriately sized for work being performed.
2. Do not include costs for "miscellaneous tools and equipment", in your proposal for a replacement value of $500 or less. Costs shown in excess of $500 shall be broken out separately.
3. Regardless of ownership, rates to be used in determining equipment rental costs shall be the lowest cost from one of the following sources:

    a. United States (U.S.) Army Corps of Engineers, Ownership and Operating Expense Schedule (use latest edition and applicable region)
    b. Construction Blue Book
    c. Local equipment rental rates, documented by actual invoice charges, or itemized vendor quotes.

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4. Estimated equipment rates shall include operating costs of all fuel, oil, lubrication, supplies, small tools, necessary attachments, ground engaging components, tires and tracks, routine repairs and maintenance (cost of major repair and overhaul is not allowed per Federal Acquisition Regulation (FAR) 31.105(d)(2)), depreciation, storage, insurance, and all incidentals. Mobilization, if applicable, may be included for equipment solely used on the modification work but must be listed separately.
5. Estimate full rate for equipment only for duration that equipment will be utilized to accomplish work of the modification.
6. Standby unit rates used in accordance with paragraph 1.3, D, 2, above. If the U.S. Army Corp of Engineers is utilized then their standby rates prevail. If Bluebook or local equipment pricing is accepted, then 1/2 of equipment costs minus any operating costs, major repair and overhaul will be accepted.
7. If equipment is in standby mode due solely to a documented NPS delay, established standby rate shall apply from the first day of the delay.
8. Equipment not used and on job site for up to five consecutive days may be classified at standby rates, provided the equipment is or has been used solely to perform work on the modification and will be necessary to complete additional modification work. Equipment still on the jobsite but not in use after five consecutive days will not be considered in the modification pricing.
9. Requests for compensation for equipment stand by time must be justified, documented and itemized separately.
10. The estimated timeframe (daily, weekly, monthly) for use of the equipment must reflect the lowest cost to the Government.

E. Establishment and Application of Overhead and Profit Percentages:

1. Home Office Overhead and Profit (OH&P) shall be applied to direct costs only. Profit shall not be applied to overhead amounts; and overhead shall not be applied to profit. Home office overhead shall contain only allowable, allocable, and reasonable costs per the contract documents and FAR Part 31. Profit percentages are based on risk factors found in FAR Part 31which have been applied to the specific type of work included in this project. Negotiated rates shall not exceed the following percentages for OH&P for contractor self-performed work:

Overhead… 10%
Profit….....4.1%

Total aggregate limit of markup (OH&P) for Contractor and Subcontractors on modification work shall not exceed 25%. The NPS will not be responsible for allocation of percentages between contractor and subcontractors at any tier.

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2. If Contractors form a partnership, partnership may only receive home office overhead and profit in same amount as an individual Contractor (refer to paragraph 1.3,E,1 above). It is the responsibility of the partners to decide on division of revenue.
3. Combined Increases and Decreases: On proposals involving both increases and decreases in the Contract Price, overhead and profit mark-ups are required on net increases and deducted on net decreases.
4. At no time can profit be calculated on Overhead or itself, it must be calculated on direct costs of work only.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Definitions
2. Construction Coordination
3. Submittals
4. Coordination Drawings
5. Requests for Information (RFIs)
6. NPS Project Management and Communication Software
7. Project Meetings
8. Environmental Coordination
9. Permits

B. Related Requirements:

1. Section 01 32 16 "Construction Schedule" for preparing and submitting Construction Contractor's construction schedule.
2. Section 01 73 40 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
4. Section 01 91 14 "Total Building Commissioning" for coordinating the work with Government's Commissioning Authority.

1.2 DEFINITIONS

A. Construction Permits – Contractor Provided Permits obtained by the Contractor based on the means and methods to conduct the work.

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1.3 CONSTRUCTION COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other Construction Contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of components, including mechanical and electrical.
5. Properly plan construction operations to include permit requirements. Allow enough time to execute permit provisions to maintain work schedule, site visits, inspections, and reporting deadlines.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Construction Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to:

1. Preparation of Construction Contractor Construction Schedule
2. Preparation of the Schedule of Values
3. Installation and removal of temporary facilities and controls
4. Delivery and processing of submittals
5. Progress meetings
6. Permit requirements
7. Pre-installation conferences
8. Project closeout activities
9. Commissioning activities

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1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of Contract Documents or standard printed data. Include following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Contracting Officer (CO) for resolution of such conflicts.
c. Indicate space requirements for routine maintenance and anticipated replacement of components during the life of the installation.
d. Show location and size of access doors required for access to concealed dampers, valves, and controls.
e. Indicate required installation sequences.

2. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
3. Follow NPS DSC Electronic Drawing Standards.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural, structural, mechanical, plumbing, fire-protection, fire-alarm, and electrical elements. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

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5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work:

    a. Runs of vertical and horizontal conduit 1-1/4 inches (32 millimeters) in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Contracting Officer will review coordination drawings to confirm Work is being coordinated; details of coordination are Construction Contractor's responsibility. If Contracting Officer determines coordination drawings are not prepared in scope or detail, or are otherwise deficient, Contracting Officer will inform Construction Contractor, who shall make changes and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 23 "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Submittal Format: Submit or post coordination drawing files using Portable Document Format (PDF) file format.

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3. Contracting Officer will furnish Construction Contractor one set of digital data files (AutoCad.dwg) of Drawings for use in preparing coordination digital data files.

    a. Contracting Officer makes no representations as to accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in AutoCad.dwg.

D. Division 1 documents:

1. Letter designating Project Superintendent
2. Construction Schedule
3. A Comprehensive Schedule of Values
4. Accident Prevention Plan
5. A List of Subcontractors for this project
6. Written statements from Subcontractors certifying compliance with applicable labor standard clauses.
7. Certificates of Insurance and Standard Form SF1413 for Contactor and all Subcontractors
8. Waste Management Plan
9. Quality Control Plan
10. Temporary Storm Water Pollution Prevention Plan (SWPP or UPPP)
11. Indoor Air Quality (IAQ) Management Plan
12. Construction Contractor Commissioning Plan
13. Historic Preservation Treatment Plan (HPTP)
14. List of Required Construction Permits. Include the following information for each permit:

    a. Name of Permit
    b. Agency(ies) with Jurisdiction issuing the permit
    c. Information required from Government to complete permit application

E. Provide items listed to Contracting Officer at least one week prior to Pre-Construction Conference, or as directed by Contracting Officer.

1. Failure to submit items may result in:

    a. Construction conference may be cancelled, Notice to Proceed may not be issued, and Contracting Officer will consider other contractual remedies.
    b. Work shall not commence until written Notice to Proceed has been issued and Certificates of Insurance and SF1413 documents are received for Construction Contractor and all Subcontractors.

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1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of Contract Documents, Construction Contractor shall prepare and submit an RFI utilizing form created on NPS project management and communication software.

1. Contracting Officer will not respond to RFIs submitted by other entities controlled by Construction Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in the work.

B. Content of RFI: Include detailed, legible description of item needing information or interpretation and the following:

1. RFI number, numbered sequentially
2. Date
3. RFI subject
4. Specification Section number and title and related paragraphs, as appropriate.
5. Drawing number and detail references, as appropriate.
6. Field dimensions and conditions, as appropriate.
7. Construction Contractor's suggested resolution: If suggested resolution impacts Contract Time or Contract Sum, Construction Contractor shall state impact in RFI.
8. Construction Contractor's signature
9. Requested date for response
10. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Form: Complete and submit on NPS project management and communication software.

D. Contracting Officer’s Action: Contracting Officer will review each RFI, determine action required, and respond. Contracting Officer will determine critical nature of each RFI and issue response accordingly.

1. The following are not considered to be RFIs and will receive no action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Construction Contractor's means and methods.

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d. Requests for coordination information already indicated in Contract Documents.
e. Requests for adjustments in Contract Time or Contract Sum.
f. Requests for interpretation of Contracting Officer's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Contracting Officer's action may include a request for additional information; time for response will date from time of receipt of additional information.
3. Contracting Officer's action on RFIs may result in need for a change to Contract Time or Contract Sum. All contract changes will be processed following terms and conditions of contract.

1.6 PROJECT MANAGEMENT AND COMMUNICATION SOFTWARE

A. Use to manage project communication and document sharing during contract period on:

1. Project directory
2. Project correspondence
3. Meeting agendas and minutes
4. Contract modifications forms and logs
5. RFI form and processing
6. Task and issue management
7. Photo documentation
8. Baseline schedule, schedule updates and calendar management
9. Submittal form and processing
10. Payment coordination documentation
11. Reminder and tracking functions
12. Archiving functions
13. Notification of submittal and RFI statuses and current responsible party
14. Permits and addendums

B. Some documents are not suitable to be shared using NPS project management and communication software. Documents containing Personal Identifying Information (PII) (i.e. certified payrolls) shall not be shared and shall be coordinated with project team as appropriate.

1.7 PROJECT MEETINGS

A. Preconstruction Conference: Before start of construction, Contracting Officer will arrange an on-site meeting with Construction Contractor. Meeting agenda will include the following as a minimum:

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1. Roles & Responsibilities / Lines of Authority
2. Park rules and regulations
3. Jobsite Safety
4. Resolution of comments on required Division 1 documents
5. Coordination of Subcontractors
6. Labor law application
7. Modifications
8. Payments to Construction Contractor
9. Payroll reports
10. Contract time
11. Liquidated damages
12. Construction Contractor Performance Evaluation
13. Display of Hotline posters
14. Notice to proceed
15. Correspondence procedures
16. NPS project management and communication software
17. Acceptance/rejection of work
18. Progress meetings
19. Submittal procedures
20. NPS Final Accessibility Inspection
21. Environmental requirements
22. Permit requirements
23. As-constructed drawings/operation and maintenance (O&M) manuals.
24. Saturday, Sunday, holiday and night work.
25. Reference materials
26. Value engineering
27. Schedule of Values

B. Progress Meetings: Contracting Officer will schedule weekly meetings with Construction Contractor.

1. Attendees: In addition to Government Representatives, each Construction Contractor, Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented. Participants at meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Meeting agenda will include:

    a. Approval of minutes of previous meetings
    b. Submittal status

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c. Review of off-site fabrication and delivery schedules.
d. Requests for information (RFI) and other issues.
e. Modifications
f. Work in progress and projected.

1) Status of required inspections (Special Inspections, Accessibility, etc.)

g. Inspections of work in progress and projected (Special inspections, Accessibility, etc.)
h. Construction Schedule update (provide updated Critical Path Method (CPM)).
i. Status of Project Record Drawings and O&M manuals.
j. Other business relating to work.
k. Permit requirements

C. Preinstallation Conferences: Conduct at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend meeting. Advise Contracting Officer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for particular activity under consideration, including requirements for:

a. Contract Documents
b. Options
c. Related RFIs
d. Related Change Orders
e. Purchases
f. Deliveries
g. Submittals
h. Review of mockups
i. Possible conflicts
j. Compatibility requirements
k. Time schedules
l. Weather limitations
m. Manufacturer's written instructions
n. Warranty requirements
o. Compatibility of materials
p. Acceptability of substrates
q. Temporary facilities and controls

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r. Space and access limitations
s. Regulations of agency(ies) with jurisdiction
t. Testing and inspecting requirements
u. Installation procedures
v. Coordination with other work
w. Required performance results
x. Protection of adjacent work
y. Protection of construction and personnel

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene conference at earliest feasible date.

1.8 ENVIRONMENTAL COORDINATION

A. Construction Contractor's Environmental Manager: Designate on-site party responsible for overseeing Construction Contractor's conformance to environmental goals for project and implementing procedures for environmental protection.

1. Qualifications: Minimum 3 years Construction experience on projects of similar size and scope; with environmental procedures similar to this project;; familiar with environmental regulations applicable to construction operations.
2. Responsibilities: Responsibilities shall include:

a. Compliance with applicable Federal, State, and local environmental regulations, including maintaining required documentation.
b. Implementation of Waste Management Plan (WMP).
c. Implementation of Indoor Air Quality (IAQ) Management Plan.
d. Implementation of Storm Water Pollution Prevention Plan (SWPPP).
e. Present overview of environmental issues and summarize site specific procedures relating to management plans at Preconstruction conference.
f. Training for Construction Contractor personnel in accordance with position requirements.
g. Monitoring and documentation of environmental procedures.

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B. Perform project quality control in accordance with requirements specified in Related Sections, including:

1. Quality Requirements
2. Regulatory Requirements
3. Indoor Air Quality (IAQ) Management
4. Noise and Acoustics Management
5. Temporary Storm Water Pollution Prevention Environmental Management
6. Construction Waste Management

C. Construction Contractor's Environmental Training Program: Construction Contractor shall provide environmental training for workers performing work on project site. Training shall include:

1. Overview of environmental issues related to building industry.
2. Overview of environmental issues related to Project.
3. Review of site-specific procedures and management plans:

    a. Construction Waste Management
    b. Indoor Air Quality (IAQ) Management
    c. Noise and Acoustics Management
    d. Temporary Storm Water Pollution Prevention

4. Pollution Prevention (P2) practices: Submit evidence of familiarity with P2 practices.
5. Green Building Rating Programs: Submit evidence of familiarity with ASTM E2432 [**xxxx**].
6. Compliance with environmental regulations: As specified in Regulatory Requirements. Submit Construction Contractor 40 CFR (Code of Federal Regulations) employee training records upon request of Contracting Officer.

D. Green Building Rating Program Documentation:

1. Prepare and submit package of documentation required in accordance with ASTM E2432. Respond to requests for answers to questions and other information from Contracting Officer to complete application process.
2. Evaluate progress toward goals, including green building rating and other goals. Coordinate work as necessary to meet the goals.

E. Provide documentation for environmental procedures as specified herein and in accordance with approved Waste Management Plan, IAQ Management Plan, and Storm Water Pollution Prevention Plan.

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1.9 PERMITS

A. General:

1. Permits and Responsibilities: Construction Contractor shall, without additional expense to the Government, be responsible for obtaining necessary licenses and permits, and for complying with Federal, State and municipal laws, codes, and regulations applicable to the performance of the work. Construction Contractor shall also be responsible for damages to persons or property that occur as a result of Construction Contractor's fault or negligence; and for materials delivered and work performed until completion and acceptance of the work.
2. For the purpose of this contract, Construction Contractor will not be considered an agent of the Government. Construction Contractor shall comply with appropriate Federal, State and local laws.

B. Coordination with Agency(ies) with Jurisdiction Issuing Permits

1. Coordination: Contact the Agency(ies) with Jurisdiction as needed and sufficiently in advance to avoid delaying work: Coordinate meetings, reporting requirements, inspections, and other requirements.

C. Administrative Procedures:

1. Coordinate scheduling and timing of required administrative provisions of project permits with Agency(ies) with Jurisdiction, Construction Manager, and Park to avoid conflicts.
2. Supply needed information to Agency(ies) with Jurisdiction issuing permits, pay fees required and provide material needed to comply with permit's conditions and provisions.
3. Upload permits to NPS project management and communication software when permits are obtained.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

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SECTION 013216 – CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

A. Section consists of Construction Schedule requirements including:

1. Schedule of Values
2. Construction Schedule Requirements.
3. Construction Schedule Updates.
4. Time Impact Analysis.

B. Purpose: The Construction Schedule ensures adequate planning, coordination, scheduling, and reporting during execution of the work by the Construction Contractor. It shall assist the Construction Contractor and Contracting Officer (CO) in monitoring the progress of the work, evaluating proposed changes, and processing Construction Contractor's monthly progress payments. It shall include the dates in the contract, phases, milestones, occupancies, holidays, weather consideration, a critical path, and the requirements of this section.

1.2 DEFINITIONS

A. Activity: A discrete part of a project identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: Allocation of the Schedule of Values for completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by the Contracting Officer.

C. Critical Path Method (CPM): Method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

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D. Critical Path: Longest connected chain of interdependent activities through the network schedule that establishes minimum overall Project duration and contains no float.
E. Float: Measure of leeway in starting and completing an activity.

1. Float: Not for the exclusive use or benefit of the Government or Construction Contractor but is jointly owned.
2. Free Float: Amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total Float: Measure of leeway in starting or completing an activity without adversely affecting planned Project completion date.

F. Resource Loading: Allocation of manpower and equipment necessary for completion of an activity as scheduled.
G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

1.3 SUBMITTALS

A. Electronic Copies: Schedules and reports submitted shall be posted on the NPS project management and communication software as PDF (portable document format) files. The intent of the Government is to limit the number of printed reports to those determined by the project team as essential.
B. Schedule of Values: After contract award and before Pre-Construction conference, submit schedule of dollar values based on Contract Price Schedule.
C. Construction Baseline Schedule: After contract award and before Pre-Construction conference, submit two paper copies of baseline schedule, large enough to show entire schedule for entire construction period. Utilize Schedule of Values in preparation of Construction Baseline Schedule.
D. Critical Path Method (CPM) Reports: Concurrent with CPM schedule, submit three paper copies of the following computer-generated reports. For each activity, include activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of predecessor and successor tasks for activities sorted in ascending order by activity number and then early start date, or actual start date if known.

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3. Total Float Report: List of activities sorted in ascending order of total float.

E. Construction Schedule Updates: On or before 7th day preceding progress payment request date, submit estimates of percent completion of each schedule activity and necessary supporting data. Provide two paper copies.

F. Construction Schedule Revisions and Time Impact Analysis: For each Construction Schedule revision, submit two paper copies of a Time Impact Analysis. Incorporate a Fragmentary Network (Fragnet) into currently accepted Construction Schedule demonstrating proposal to incorporate a modification, change, delay, or Construction Contractor request.

1.4 QUALITY ASSURANCE

A. Construction Contractor shall meet with Contracting Officer on day of the preconstruction conference to go over:

1. Review software limitations, content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, interim milestones, and partial Government occupancy/substantial completions.
4. Review delivery dates for Government-furnished products.
5. Review schedule for work of separate Government contracts.
6. Review time required for review of submittals and re-submittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review time required for obtaining and activating permits.
10. Review and finalize list of construction activities to be included in schedule.
11. Review baseline schedule comments, resolve issues and progress on incorporating them
12. Review procedures for updating schedule.
13. Discuss reporting requirements and establish protocol for naming and transmitting electronic schedules.

B. Construction Contractor's Schedule Representative: Before the preconstruction conference, designate an authorized representative to be responsible for preparing and maintaining the Construction Schedule. Submit resume outlining qualifications of Scheduler to Contracting Officer for acceptance. Scheduler shall have prepared and maintained at least 5 previous schedules of similar size and complexity similar to this Contract, demonstrating proficiency of using scheduling software. Authorized representative will be responsible for preparing the Baseline Schedule, required updates, revisions, Time Impact Analyses, and reports.

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1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Construction Contractors.
B. Coordinate Construction Baseline Schedule with Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. In developing Construction Baseline Schedule, ensure Subcontractor's work at all tiers, and prime Construction Contractor's work, is included and coordinated.
2. Secure time commitments for performing critical elements of work from parties involved.
3. Coordinate each construction activity in network with other activities and schedule in proper sequence.

PART 2 - PRODUCTS

2.1 SCHEDULE OF VALUES

A. Breakdown each lump-sum item into component work activities used in the schedule for which progress payments may be requested. Work activities broken out within schedule of values shall be integrated into and made a logical part of the construction baseline schedule. Total costs for the component work activities shall equal contract price for that lump-sum item. Contracting Officer may request data to verify accuracy of dollar values. Include mobilization, general condition costs, overhead and profit in the total dollar value of unit price items and in the component work activities for each lump-sum item. Do not include mobilization, general condition costs, overhead or profit as a separate item.
B. Do not break down unit price items. Use only the contract price for unit price items.

C. Total cost of all items shall equal the contract price. The Schedule of Values will form the basis for progress payments and the Construction Schedule.

2.2 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Construction Baseline Schedule: Prepare Construction Baseline Schedule using a computerized, cost and resource-based**,** time-scaled Critical Path Method network analysis diagram for the Work.

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1. Develop and finalize Construction Baseline Schedule so it can be accepted for use no later than 30 days after date established for the Notice of Award.

    a. Failure to include any work item required for performance of this Contract shall not excuse Construction Contractor from completing work within applicable completion dates, regardless of Governments acceptance of schedule.

2. Establish procedures for monitoring and updating Construction Baseline Schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

B. Construction Baseline Schedule Preparation: Prepare a list of all activities required to complete the Work. Using preliminary Critical Path Method network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate estimated duration, sequence requirements, and relationship of each activity in relation to other activities.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the Critical Path Method schedule within the limitations of the Contract Time.
4. Show sequence and interdependence of activities required for completion of work. Ensure work sequences are logical and Construction Baseline Schedule shows a coordinated plan of the work.
5. Resource loading of each activity shall include personnel by labor category and equipment type and capacity proposed to complete the activity in duration shown.
6. Consider seasonal weather conditions in planning and scheduling work influenced by high and low ambient temperatures, wind, or precipitation to ensure completion of work within contract time.
7. Time Frame: Proposed duration assigned to each activity shall be Construction Contractor's best estimate of time required to complete activity considering the scope and resources planned for activity.

    a. An early finish date may be shown but the late finish date shall be same date as last day of contract period. An early completion schedule shall contain:

        1) Insert an activity titled "Project Float" as a successor to last activity in early project completion schedule network.

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2) Add a milestone titled "Contract End Date" as a successor to the activity "Project Float".
3) Add duration to the activity "Project Float" as required so the milestone "Contract End Date" equals the last day of Contract Period.

b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
c. Construction Contractor shall limit use of lead or lag duration's between schedule activities.
d. Project Calendars: Develop and incorporate the following calendars:

1) Administrative Calendar: Include calendar based on a 7-day week to be used on activities based on calendar days. Apply this calendar to administrative tasks or other tasks not affected by non-working days (Federal Holidays, weather, etc.).
2) Project Calendar: Include calendar based on planned work week for the project. Include Federal Holidays, weekends, and non-workdays indicated in contract documents. Apply this calendar to activities not anticipated to be affected by weather. Be clear when identifying number of work days in work week.
3) Weather Calendar: Utilize Project Calendar and show anticipated normal downtime related to weather as non-working time. Weather days shall be based on data for local area from a reliable source like the National Oceanic and Atmospheric Administration (NOAA), National Park Service records, or source acceptable to Contracting Officer. Apply this calendar to activities anticipated to be affected by weather.

e. Activity Duration: Define so no activity is longer than 14 days, except for non-construction activities including mobilization, shop drawings and submittals, fabrication and delivery of materials and equipment.
f. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in the schedule. Procurement cycle activities can include submittals, approvals, purchasing, fabrication, and delivery.
g. Submittal Review Time: Include review and re-submittal times indicated. Coordinate submittal review times in Construction Baseline Schedule.
h. Startup and Testing Time: Include not less than 5 days for startup and testing and commissioning activities.

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i. Substantial Completion: Allow time for Government administrative procedures necessary for certification of Substantial Completion. (For more information, refer to Specification 01 77 00 "Closeout Procedures.")

8. Constraints: Include constraints and work restrictions indicated in Contract Documents and as follows in schedule and show how the sequence of Work is affected.

a. Phasing: Arrange list of activities on schedule by phase.
b. Work under More Than One Contract: Include a separate activity for each contract.
c. Work Restrictions: Show effect of the following on the schedule:

1) Coordination with existing construction
2) Limitations of continued occupancies
3) Uninterruptible services
4) Partial occupancy before Substantial Completion
5) Use of premises restrictions
6) Provisions for future construction
7) Seasonal variations
8) Environmental control
9) Permit provisions

d. Work Stages: Indicate important stages of construction for each major portion of the Work.

1) Subcontract awards
2) Submittals
3) Purchases
4) Mockups
5) Fabrication
6) Sample testing
7) Deliveries
8) Installation
9) Tests and inspections
10) Adjusting
11) Curing
12) Building flush-out.
13) Building commissioning activities.

9. Milestones: Include milestones indicated in Contract Documents in schedule, including, but not limited to, Notice to Proceed, Substantial Completion.

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C. Joint Review, Revision, and Acceptance:

1. Within seven calendar days of receiving Construction Contractor's proposed Construction Baseline Schedule, Contracting Officer shall review initial Construction Baseline Schedule.
2. Within seven calendar days after review, Construction Contractor shall revise and resubmit Construction Baseline Schedule in accordance with comments presented from review.
3. In the event the Construction Contractor fails to define any element of work, activity, or logic and the Contracting Officer review does not detect this omission or error, such omission or error, when discovered by Construction Contractor or Contracting Officer, shall be corrected by Construction Contractor within seven calendar days and shall not affect contract period.
4. Upon acceptance of the Construction Baseline Schedule, Contracting Officer saves schedule as a baseline and updates on a monthly basis. Construction schedule update will be used to evaluate Construction Contractor's monthly applications for payment based upon information developed at monthly Construction Schedule update meeting.

D. Cost Correlation: In the heading of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of dates used to prepare payment requests.

1. Construction Contractor shall assign cost to construction activities on Construction Baseline Schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Contracting Officer’s approval, be assigned to fabrication and delivery activities. Costs shall be included for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable).
2. Each activity cost shall reflect an accurate value based on the Contract Price Schedule.
3. Total cost assigned to activities shall equal total Contract Price.

E. Recovery Schedule: When periodic schedule update indicates Work is 14 or more calendar days behind current accepted schedule, a separate recovery schedule indicating means by which Construction Contractor intends to regain compliance with the schedule shall also be submitted. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery shall be accomplished.

F. Computer Software: Prepare schedules using a program developed specifically to manage construction schedules.

1. Use Microsoft Project or Primavera, for current Windows operating system.

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PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE UPDATES

A. Progress Meeting Updates: Provide a 2 week look-ahead schedule, derived from the currently accepted schedule, before each weekly progress meeting. Utilize look-ahead schedule to facilitate and take notes on discussions held during progress meeting.
B. Monthly Schedule Updates:

1. General: Update Construction Schedule on monthly basis to reflect construction progress and activities throughout entire contract period and until project substantial completion. The status date of each schedule update shall be the 7th day preceding the progress payment request date.
2. Procedure: Construction Contractor shall meet with Contracting Officer each month at Construction Schedule update meeting to review progress made through the status date of the Construction Schedule update, including dates activities were started or completed and percentage of work completed on each activity started or completed.
3. Reports: Concurrent schedule revisions, prepare tabulated reports showing:

    a. Identification of activities that have changed
    b. Changes in early and late start dates
    c. Changes in early and late finish dates
    d. Changes in activity durations in workdays
    e. Changes in the critical path
    f. Changes in total float or slack time
    g. Changes in the Contract Time

4. Narrative: Report shall include a brief description of actual progress made during update period; actual and potential delaying activities; impediments to progress; issues related to inclement weather; progress toward established milestones and project float. Report shall include a brief description of work anticipated to be performed in the next month. Minor revisions to the schedule should be identified for evaluation and acceptance or rejection.
5. As Work progresses, indicate Actual Completion percentage for each activity.
6. If schedule update shows a late finish date after contract completion date, include:

    a. Known delays
    b. Actions to get back on schedule
    c. Pending modifications
    d. Impediments or constraints affecting progress

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7. Progress Payments: Monthly updating of the currently accepted Construction Schedule shall be an integral part of the process upon which progress payments will be made. If Construction Contractor fails to provide schedule updates or revisions, a portion of the monthly payment may be retained until corrections have been made.

C. Distribution: Distribute copies of accepted schedule to Contracting Officer, Contracting Officers Representative, Construction Management Representative, Subcontractors, testing and inspecting agencies, and other parties identified by Construction Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to same parties and post in same locations. Delete parties from distribution when they have completed their assigned portion of the Work.

D. Construction Schedule Revisions:

1. Required Revisions: If, as a result of the monthly schedule update, it appears the currently accepted Construction Schedule no longer represents actual prosecution and progress of the work, Contracting Officer will request, and Construction Contractor shall submit, a revision to the Construction Schedule. Construction Contractor may also request reasonable revisions to currently accepted Construction Schedule in event the Construction Contractor's planning for the work is revised. If Construction Contractor desires to make changes, Construction Contractor shall notify Contracting Officer in writing, stating reason for proposed revision. Accepted revisions shall be incorporated into currently accepted Construction Schedule for next monthly schedule update.
2. Procedure: If revision to currently accepted Construction Schedule is contemplated, Construction Contractor or Contracting Officer shall advise the other in writing at least seven calendar days prior to next monthly schedule update meeting, describing revision and reasons for the revision. Government-requested revisions will be presented in writing to the Construction Contractor, who shall respond in writing within seven calendar days.
3. Reports: Concurrent with making revisions to schedule, prepare tabulated reports showing:

a. Identification of activities changed
b. Changes in early and late start dates
c. Changes in early and late finish dates
d. Changes in activity durations in workdays
e. Changes in critical path
f. Changes in total float or slack time

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3.2 TIME IMPACT ANALYSIS FOR CONTRACT MODIFICATIONS CHANGES DELAYS AND CONSTRUCTION CONTRACTOR REQUESTS:

1. Requirements: When contract modifications or changes are initiated, delays experienced, or Construction Contractor desires to revise currently accepted Construction Schedule, Construction Contractor shall submit to Contracting Officer a written time impact analysis illustrating the influence of modification, change, delay, or Construction Contractor request on contract time.
2. Time Extensions: Activity delays, resulting in a late completion date projection, shall not automatically mean an extension of contract time is warranted or due to Construction Contractor. It is possible a modification, change, or delay will not affect existing critical path activities or cause non-critical activities to become critical. A modification, change, or delay may result in absorbing a part of available total float that may exist within an activity chain of the Schedule, not causing any effect on contract time. Time extensions will be granted in accordance with terms of contract.
3. Extension of contract time will be granted only to the extent the equitable time adjustments to activity or activities affected by modification, change, or delay exceeds total (positive or zero) float available on a particular activity.
4. Procedure: Each time impact analysis shall be submitted within time period stated in a request for proposal, or time period designated under the clauses entitled Changes or Default. In cases where Construction Contractor does not submit a written request for extension of time and a time impact analysis within the designated time, it is mutually agreed that the particular modification, change, delay, or Construction Contractor request does not require an extension of the contract time. Upon acceptance, time impact analysis shall be incorporated into currently accepted Construction Schedule at next monthly schedule update.
5. Contract Modifications: Prepare time-impact analysis using fragnets to demonstrate effect of proposed change on overall Construction Schedule for each proposed contract modification concurrent with submission.

END OF SECTION

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SECTION 013233 – PHOTO DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Existing condition images
2. Periodic construction images

B. See Section 017700 "Closeout Procedures" for a complete listing of closeout documents.
C. See Section 017900 "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of National Park Service (NPS) personnel.

1.2 SUBMITTALS

A. Construction Images: Submit images electronically within seven days of taking the image. Include:

1. Date, time and number (sequentially number all images) in filename.
2. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
3. Submit digital images exactly as originally recorded in digital camera, without alteration, or modifications using image-editing software.

B. Closeout: Submit complete set of digital image electronic files as a Project Record Document**.** Submit on provide USB drive or transfer through GC's share point / procore site or sharepoint site provided by Park. .

1. Provide index as separate file on Disc. List each image as a file name with number, date, and time. Include description and or vantage point image was taken.
2. Submit images that have the same aspect ratio as the sensor, un-cropped.

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PART 2 - PRODUCTS

2.1 FORMAT REQUIREMENTS

A. Media: DVD-R Archival Gold

B. Media Labels: Provide USB drive or transfer through GC's share point / procore site or sharepoint site provided by Park.

C. Images: Provide sRGB (standard Red Green Blue) color images in JPEG (Joint Photographic Experts Group) format. Minimum sensor size of 8 megapixels, and at image resolution of not less than 3200 by 2400, and 300 dpi (dots per inch).

PART 3 - EXECUTION

3.1 CONSTRUCTION IMAGES

A. General: Take digital images using the maximum range of depth of field, in-focus, to clearly show the Work. No blurry or out-of-focus areas accepted.

1. Maintain index with each set of Construction images and identify the number, date, time, and description for each.
2. Maintain one set of images accessible in field office at Project site available for reference.

B. Existing Condition Images: Before starting construction, take color digital images of Project, including existing items to remain during construction, from different vantage points.

1. Flag construction limits before recording construction images.
2. Take eight separate images to show existing conditions adjacent to property before starting Work.

C. Periodic Construction Images: Take 12 color, digital images monthly, coinciding with cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last images were taken.

D. Additional Images: Contracting Officer may issue requests for additional images.

1. Three days advance, where feasible.
2. In emergency situations, take additional images within 24 hours of request.

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3. Additional images include, but are not limited to:

    a. Immediate follow-up when on-site events result in construction damage or losses.
    b. Fabrication locations away from Project site.
    c. Substantial Completion of a major phase or component of Work.
    d. Extra record images at time of final acceptance.

END OF SECTION

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SECTION 013323 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written, graphic information, and physical samples that require Government's responsive action.

B. Informational Submittals: Written information that does not require Government's responsive action. Submittals may be rejected for not complying with requirements.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 GENERAL SUBMITTAL PROCEDURES

A. General: Prepare and submit submittals required by individual Specification Sections and in some cases as requested in drawings. Types of submittals are indicated in individual specific sections.

1. Contracting Officer (CO) reserves right to require submittals in addition to those called for in individual sections.

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B. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to Procore Construction Management Software or equal web-based Project management software website. Enter required data in web-based software site to fully identify submittal.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Review for legibility, accuracy, completeness, and compliance with Contract Documents.

1. Coordinate submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of Work so processing will not be delayed because of need for concurrent review coordination.

a. Contracting Officer reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Submittal List: Submittal list is attached to the end of this Specification Section. The intent is to provide an overall summary of submittal requirements. The requirements of individual Specification Sections and terms and conditions of the Contract still apply regardless of what is shown on submittal list.

E. Processing Time: Allow enough time for submittal review and re-submittals. Contract time extensions will not be authorized if submittals are not transmitted with enough time to permit processing, including re-submittals.

1. Action Submittals

a. Initial Review: Allow ten days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
b. Re-submittal Review: Allow ten days for review of each re-submittal.

2. Informational submittals

a. Review: Allow seven days for review of each submittal.

F. Approved Equals:

1. For each item proposed as an "approved equal," submit supporting data, including:

a. Drawings and samples as appropriate.
b. Comparison of the characteristics of the proposed item with that specified.

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c. Changes required in other elements of the work because of the substitution.
d. Name, address, and telephone number of vendor.
e. Manufacturer's literature regarding installation, operation, and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.

2. A request for approval constitutes a representation that Construction Contractor:

a. Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.
b. Will provide the same warranties for the proposed item as for the item specified.
c. Has determined that the proposed item is compatible with interfacing items.
d. Will coordinate installation of an approved item and make changes required in other elements of the work because of the substitution.
e. Waives claims for additional expenses that may be incurred as a result of the substitution.

G. Submittals: Identify and incorporate information in each submittal file as follows:

1. Transmittal Form (CM-16): Utilize NPS Transmittal Form for all submittals. No action will be taken on a submittal item unless accompanied by this Transmittal Form.
2. Physical samples: Complete Transmittal Form and deliver physical sample to the Contracting Officer (or designee) on site for processing. All comments and actions will be documented on the Transmittal Form.

H. Identification: Submittal number or other unique identifier, including revision identifier.

1. Submittal number shall use a sequential number (e.g. .001). Re-submittals shall include alphabetic suffix after another decimal point (e.g. .001.A).

I. Re-submittals: Make re-submittals using same process used with initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in the title block on the Transmittal Form (CM-16) and clearly indicate extent of revision.
3. Re-submit submittals until they are marked "Approved" or "Approved with notations".

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and others as necessary for performance of construction activities.

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K. Use for Construction: Use only final submittals with mark indicating "Approved" or "Approved with notations". Ensure notations have been incorporated and, at a minimum, keep one copy of final approved submittal on site for use during construction.

1.4 CONSTRUCTION CONTRACTOR'S USE OF CAD/BIM FILES

A. General: At Contractor's written request, copies of CAD files will be provided to Contractor for Contractor's use in connection with Project, following the Contractor's execution of a waiver prepared by the Contracting Officer, the text of which is reproduced below:

USE OF ELECTRONIC FILES

The electronic files provided are not purported to contain information that reflects actual, measured conditions as they exist at the project site. Further, they do not reflect changes or addenda, if any, to the design of the Project made after the date of the last revisions. The information in the files was developed for its use in designing the Project. No other representation is hereby made that the files are suitable for any other use or for any other particular purpose, including but not limited to use as a base for the preparation of shop drawings, as coordination drawings, or as construction documents for additions, tenant fit-outs or modifications to the Project. Contractors are urged to perform dimensional and completeness reviews of all documents. In case of any conflict between the information contained in these files and that contained in the hard copy of the Contract Documents, their addenda and modifications, the latter shall govern.

Transmission of these electronic files does not convey either the copyright in the designs contained therein or a license to copy or use them for any purpose except the construction of the Project. Schwartz/Silver Architects Inc., and their consultants do not warrant that these files are compatible with any software or hardware other than that on which they were produced. No further reproduction and distribution of these files may be made without the written consent of the authors.

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Authorized Signature

_____

Company

_____

Date

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each submittal to show which products and options are applicable.
3. As applicable, include:

a. Manufacturer's product specifications.
b. Manufacturer's installation instructions: When Contract Documents require compliance with manufacturer's printed instructions, provide one complete set of instructions to Contracting Officer and keep another complete set of instructions at the project site until substantial completion.
c. Manufacturer's catalog cuts: Submit only pertinent pages; mark each page of standard printed data to identify specific products proposed for use.
d. Wiring diagrams showing factory-installed wiring.
e. Printed performance curves.
f. Operational range diagrams.
g. Compliance with specified referenced standards.
h. Testing by recognized testing agency.

4. Submit product data in PDF (portable document format) file format before or concurrent with samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of CAD/BIM Drawings is otherwise permitted.

1. Preparation: Fully illustrate requirements in Contract Documents. As applicable, include:

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a. Dimensions
b. Identification of products
c. Fabrication and installation drawings
d. Roughing-in and setting diagrams
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring
f. Shopwork manufacturing instructions
g. Templates and patterns
h. Schedules
i. Notation of coordination requirements
j. Notation of dimensions established by field measurement
k. Relationship to adjoining construction clearly indicated
l. Seal and signature of professional engineer if specified
m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring

2. Submit shop drawings as PDF electronic file

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Complete and post the Transmittal Form (CM-16) on the NPS project management and communication software website for processing and documentation of action on submitted samples.
3. Identification: Attach label on unexposed side of Samples that includes:

a. Generic description of Sample
b. Product name and name of manufacturer
c. Sample source
d. Submittal Number and title of appropriate Specification Section

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing full range of colors, textures, and patterns available.

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a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Contracting Officer will return with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit four sets of Samples. Contracting Officer will retain three Sample sets; remainder will be returned. Retain Sample set as a Project Record Sample.

D. Construction Materials: Construction Contractor is encouraged to submit products made out of recycled or environmentally responsible material. Every effort will be made by NPS to approve these materials.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by individual Specification Sections.

1. Post informational submittals as PDF electronic files directly to the NPS project management and communication software.
2. Certificates and Certifications: Provide a notarized statement with signature of entity responsible for preparing certification. Certificates and certifications shall be signed by officer or other individual authorized to sign documents on behalf of that entity.
3. Informational submittals that do not comply with requirements specified in Contract Documents will be rejected and one copy will be returned.

B. Coordination Drawings: Comply with requirements specified in Section 013100 "Project Management and Coordination."

C. Construction Contractors Construction Schedule: Comply with requirements specified in Section 013216 "Construction Schedule."

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D. Accident Prevention Plan: Comply with requirements specified in Section 013523 "Safety Requirements."

E. Schedule of Values: Comply with requirements specified in Section 013216 "Construction Schedule."

F. Waste Recycling Plan: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

G. Quality Control Plan: Comply with requirements specified in Section 014000 "Quality Requirements."

H. Indoor Air Quality Management Plan: Comply with requirements specified in Section 015719.11 "Indoor Air Quality Management."

I. Sustainable Design Requirements: Comply with the requirements specified in Section 018113 “Sustainable Design Requirements for Non-LEED Projects.”

J. Qualification Data: Prepare written information demonstrating capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on American Welding Society (AWS) forms. Include names of firms and personnel certified.

L. Installer Certificates: Prepare written statements on manufacturer’s letterhead certifying Installer complies with Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Prepare written statements on manufacturer’s letterhead certifying manufacturer complies with Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Prepare written statements on manufacturer’s letterhead certifying product complies with Contract Documents.

O. Material Certificates: Prepare written statements on manufacturer’s letterhead certifying material complies with Contract Documents.

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P. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in Contract Documents.

Q. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

S. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in Contract Documents.

T. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in Contract Documents.

V. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

W. Design Data: Prepare written and graphic information, including: performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

X. Manufacturer's Instructions: Prepare written or published information documenting manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

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Y. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. As applicable, include:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Summary of installation procedures being followed, compliance with requirements and, if not, what corrective action was taken.
3. Results of operational and other tests and a statement of whether observed performance complies with the requirements.

Z. Permit Compliance Products: Prepare required information for compliance with permit provisions. Products include written notification of project startup, suspension, and completion of work; photo documentation of site conditions; reports; and drawings.

PART 3 - EXECUTION

3.1 CONSTRUCTION CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of Contract and for compliance with Contract Documents. Note corrections and field dimensions.

3.2 CONTRACTING OFFICER'S ACTION

A. General: Submittals will be disapproved without technical review if identification information is missing, not filled in, or if placed on back of submittal; an incorrect format of submittals is provided; transmittal form is incorrectly filled out; submittals are not coordinated; or submittals do not show evidence of Construction Contractor's approval.

1. Any work done or orders for materials or services placed before approval shall be at Construction Contractor's own risk.

B. Action Submittals: Contracting Officer will review each submittal, generate comments on corrections or modifications required, and indicate appropriate action on the Transmittal Form (CM-16). Submittal will be marked as defined below:

1. APPROVED: Acceptable with no corrections.
2. APPROVED WITH NOTATIONS: Minor corrections or clarifications required. Comments are clear and no further review is required. Construction Contractor shall address review comments when proceeding with the work.

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3. DISAPPROVED - RESUBMIT: Rejected as not in accordance with the contract or as requiring major corrections or clarifications. Contracting Officer will identify reasons for disapproval. Construction Contractor shall revise and resubmit with changes clearly identified.

C. Informational Submittals: Contracting Officer will review each submittal and will either accept or reject it.

D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

END OF SECTION

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SECTION 013523 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes establishing an effective accident prevention program and providing a safe working environment for personnel and visitors.

1.2 SUBMITTALS

A. Accident Prevention Plan (APP): Submit APP after contract award and before Pre-Construction conference. Contracting Officer (CO) will review proposed APP. If APP requires any revisions or corrections, Contractor shall resubmit Plan within 10 days. No progress payments will be made until the APP is accepted.

1.3 QUALITY ASSURANCE

A. Comply with contract clauses "Accident Prevention" and "Permits and Responsibilities." In case of conflicts between Federal, State, and local safety and health requirements, the most stringent shall apply. Onsite equipment shall meet 29 CFR 1926 (Code of Federal Regulations) (Occupational Safety and Health Administration (OSHA)) requirements. Failure to comply with requirements of this section and related sections may result in suspension of work.

B. Site Safety Supervisor:

1. Designate authorized onsite representative for preparation and maintenance of the APP.
2. Shall be responsible for:

    a. Implementation and enforcement of the APP
    b. Daily safety inspections
    c. Conducting and documenting weekly and monthly safety meetings
    d. Review of safety requirements at progress meetings
    e. Compilation and maintenance of Safety Data Sheets (SDS) and safety reference materials
    f. Tracking and resolution of safety violations

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g. Site personnel and visitor compliance with site safety and health requirements and APP
h. Investigation and reporting of accidents and injuries

C. Qualifications of Employees:

1. Physically and able to perform their assigned duties in a safe manner.
2. Do not allow employees whose ability or alertness is impaired because of prescription or illegal drug use, fatigue, illness, intoxication, or other conditions that may expose themselves or others to injury to perform work.
3. Provide operating instructions for equipment. Operators of vehicles, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, operating instructions, and be fully capable of operating such equipment. Retain copies of operator licenses and certifications onsite.

1.4 ACCIDENT REPORTING

A. Reportable Accidents: Defined as: death, occupational disease, and/or traumatic injury to employees or the public; fires; and/or property damage by accident in excess of $100.

1. Notify Contracting Officer immediately in the event of a reportable accident.
2. Fill out and forward an Accident/Property Damage Report Form (CM-22) to Contracting Officer within 7 days of a reportable accident. Obtain form from Contracting Officer.

1.5 RESOURCES

A. COVID-19 (Coronavirus Disease 2019) information provided below is not intended to provide a complete analysis of requirements for Contractor and is provided as a courtesy.

1. Coronoavirus.gov
2. Occupational Safety and Health Administration (United States Department of Labor) - COVID-19
3. Center for Disease Control (CDC)

a. Get the Facts About Coronavirus
b. What Construction Workers Need to Know about COVID-19

4. Federal Emergency Management Agency (FEMA) - Coronavirus (COVID-19) Response
5. National Park Service (NPS) - NPS Public Health Update

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PART 2 - PRODUCTS

2.1 ACCIDENT PREVENTION PLAN (APP)

A. APP shall be written to comply with OSHA and project requirements (generic plan is not acceptable) including but not limited to:

1. Name and qualifications of supervisor responsible to carry out program.
2. Weekly and monthly safety meetings shall be documented with topics and attendees.
3. First aid and rescue procedures.
4. Job Hazard Analysis (JHA) for each major phase. List of hazards associated and methods proposed to provide for property protection and safety of the public, National Park Service personnel, and Contractor's employees. Include initial and continuing training.
5. Planning for possible emergency situations, as detailed in Article 1.2. Such planning shall take nature of construction, site conditions, and degree of exposure of persons and property into consideration.
6. Infectious Disease Preparedness:

    a. Contractors are responsible for their employees' safety and the safety of job site visitors during the performance of this contract. We encourage Contractors to follow guidance from the Department of Labor (DOL), Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), and all other applicable local, city, and state mandates. We encourage Contractors to develop policies for infection prevention and an Infectious Disease Preparedness and Response Plan.
    b. To the extent appropriate, Contractors should include the protective health and safety measures they intend to implement in any accident prevention or safety submittals required under this contract. These plans should contain preventive measures the Contractor intends to follow while performing work on government property as well as responsive and corrective actions to be taken if an employee exhibits symptoms or tests positive for contagion.
    c. Upon contract award, Contractors should communicate with Contracting Officer regarding Contractor decisions and actions to protect the health and safety of workers for the duration of contract performance under which pandemic conditions exist.

2.2 FIRST AID FACILITIES

A. Provide adequate facilities for number of employees and appropriate to construction hazards.

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2.3 PERSONNEL PROTECTIVE EQUIPMENT (PPE)

A. Selection shall conform to OSHA Subpart E.

PART 3 - EXECUTION

3.1 DAILY SAFETY INSPECTIONS

A. Conduct daily safety inspections and maintain daily safety reports which include:

1. Area/operation inspected
2. Date of inspection
3. Identified hazards
4. Corrective actions taken

3.2 EMERGENCY INSTRUCTIONS

A. Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at work site.

3.3 FIRE AND LIFE SAFETY

A. Comply with requirements of National Fire Protection Association (NFPA) 241 (Standard for Safeguarding Construction, Alteration, and Demolition Operations).

B. Comply with the requirements of the NPS Lowell National Historical Park Hot Work Permit for all construction activities that may produce spark or flame including but not limited to: soldering, grinding, field welding.

3.4 HAZARDOUS MATERIALS

A. Hazardous materials: Explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

B. Store hazardous materials in accordance with manufacturer's and OSHA Subpart D requirements. Maintain Safety Data Sheets (SDS) for each chemical readily available on site.

1. Immediately report spills of hazardous materials to the Park.

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2. Maintain a spill emergency response kit.
3. Train employees how to respond to a spill and use emergency response kit.

3.5 PROTECTIVE EQUIPMENT

A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair personal items as appropriate before issuing to another individual.

3.6 SAFETY MEETINGS

A. As a minimum, conduct one weekly 15-minute "toolbox" safety meeting conducted by a foreman or supervisor and attended by construction personnel at worksite. Topics shall coincide with work scheduled for following week. Document and submit meeting minutes to Contracting Officer within one day after meeting.

B. Conduct monthly safety meetings for personnel, contractors, and subcontractors performing work on the site. Notify Contracting Officer of meeting dates and times. Meetings shall be used to: review effectiveness of Contractor's safety effort; resolve current health and safety problems; provide a forum for planning safe construction activities, and for updating Accident Prevention Plan. Contracting Officers Representative will attend meetings and enter results of meetings into the daily log.

3.7 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

A. A hard hat use area shall be designated by Contractor. Hard hat area shall be posted by Contractor in a manner satisfactory to Contracting Officer.

B. It is Contractor's responsibility to require persons working on or visiting site to wear hard hats and PPE in good repair at all times. As a minimum, maintain [**six**] <**Insert number**> hard hats and other APP required equipment.

3.8 TRAINING

A. First Aid: Provide training to personnel to ensure prompt and efficient first aid.

B. Hazardous Material: Train and instruct each employee exposed to hazardous material in safe and approved methods of handling and storage.

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SECTION 013591 - HISTORIC PRESERVATION TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for historic treatment on Project including, but not limited to:

1. Definitions
2. Submittals
3. Quality Assurance
4. Storage and protection of existing historic materials
5. Project site conditions
6. Historic Preservation Treatment Plan
7. Protection, General
8. Protection during application of chemicals
9. Protection during use of heat-generating equipment
10. Historic preservation treatment procedures

1.2 DEFINITIONS

A. "Preservation" - To apply measures necessary to sustain existing form, integrity, and materials of historic property. Work may include preliminary measures to protect and stabilize the property.

B. "Rehabilitation" - To make possible a compatible use for property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values.

C. "Restoration" - To accurately return form, features, and character of a property to its appearance at a particular period of time by means of removal of features from other periods in its history and repair and reconstruction of missing and deteriorated features from the restoration period.

D. "Reconstruction" - To reproduce in exact form and detail, a building, structure, or artifact as it appeared at a specific period in time. Reconstructed elements do not possess historic integrity in their own right since they are not original fabric.

E. "Stabilize" - To apply measures designed to reestablish a weather-resistant enclosure and structural reinforcement of an item or portion of the building while maintaining essential form as it exists at present. This level of intervention is aimed at retarding or arresting adverse impacts to

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structures.

F. "Protect and Maintain" - To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.

G. "Repair" - To stabilize, consolidate, or conserve; to retain existing materials and features while employing as little new material as possible. Repair includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials. Within restoration, repair also includes limited replacement in kind, rehabilitation, and reconstruction, with compatible substitute materials for deteriorated or missing parts of features when there are surviving prototypes.

H. "Replace" - To duplicate in its entirety, a historic element or feature by matching its historic pattern, detail and appearance. Replacement is justified when original or historic elements are damaged beyond repair or are missing. Replacement conditions and methods include:

1. Replacement with Original or Historic Fabric: Includes fabric salvaged from other locations or projects having identical architectural qualities. Duplication of appearance using identical material possessing historical significance.
2. Replacement with New Materials: Includes replacement with new material of like kind (custom fabricated of manufactured). Duplication of appearance using like material.
3. Replacement with Substitute Materials: Includes replacement with a compatible substitute that is frequently contemporary and unlike the historic fabric. Duplication of appearance using modern (non-traditional) material Use of substitute materials is not approved unless matching materials are not available.

I. "Remove" - To demolish or detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

J. "Remove and Salvage" - To detach items from existing construction and deliver them to Contracting Officer (CO) or designee.

K. "Remove and Reinstall" - To detach items from existing construction, repair and prepare for reuse, and reinstall where indicated.

L. "Existing to Remain" or "Retain" - Existing items of construction not to be removed and not otherwise indicated to be removed and salvaged or removed and reinstalled.

M. "Material in Kind" - Material that closely matches existing materials through comparison of architectural qualities and salient characteristic such as species, cut, color, grain, dimension, profile, thickness, and finish.

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1.3 SUBMITTALS

A. Historic Preservation Treatment Plan:

1. After contract award and before Pre-Construction conference, submit for approval a written Historic Preservation Treatment Plan (HPTP).
2. If the plan requires revisions or corrections, Contractor shall resubmit plan within 10 days.
3. No change in approved plan may be made without written concurrence by Contracting Officer.

B. Alternative Methods and Materials: If alternative methods and materials to those indicated are proposed for any phase of work, provide a written description including evidence of successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this Project.

C. Photographs or Videotape: In accordance with Section 01 32 33 "Photographic Documentation," show existing conditions of adjoining construction and site improvements including finish surfaces that might be misconstrued as damage caused by historic treatment operations. Submit before work begins.

1.4 QUALITY ASSURANCE

A. Historic Preservation Treatment Specialist Qualifications: Experienced firm with required certifications and training able to demonstrate through past performance they are qualified to perform this work.

1.5 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. Removed and Salvaged Historic Materials:

1. Clean salvaged historic items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in secure area until delivery to Contracting Officer.
4. Transport items to storage area.
5. Protect items from damage during transport and storage.
6. Do not dispose of items removed from existing construction without prior written consent of Contracting Officer.

B. Removed and Reinstalled Historic Materials:

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1. Clean and repair historic items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use as designed.

C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling during historic treatment. When permitted by Contracting Officer, items may be removed to suitable, protected storage location during historic treatment [**and cleaned**] and reinstalled in their original locations after historic treatment operations are complete.

D. Storage and Protection: When removed from existing location, store historic materials within weather-tight enclosure protected from wetting by rain, snow, or ground water, and temperature variations. Secure stored materials to protect from theft.

1. Identify removed items with an inconspicuous mark indicating original location.
2. Develop key plan when many similar items are scheduled for removal and reinstallation.

1.6 PROJECT-SITE CONDITIONS

A. Exterior Cleaning and Repairing:

1. Proceed with work only when forecasted weather conditions are favorable.

   a. Wet Weather: Do not attempt repairs during rainy or foggy weather. Do not apply primer, paint, putty, or epoxy when relative humidity is above 80 percent. Do not remove exterior elements of structures when rain is forecast or in progress.
   b. Do not perform exterior wet work when air temperature is below 40 degrees Fahrenheit (5 degrees Celsius).
   c. Do not begin cleaning, patching, or repairing given likelihood of frost or freezing.
   d. Do not begin cleaning when either air or surface temperature is below 45 degrees Fahrenheit (7 degrees Celsius) unless approved means are provided for maintaining 45 degrees Fahrenheit (7 degrees Celsius) temperature of air and materials during, and for 48 hours subsequent to, cleaning.

2. Perform cleaning and rinsing of the exterior only during daylight hours.

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B. National Park Service will occupy buildings immediately adjacent to historic treatment area. Conduct historic treatment so National Park Service operations will not be disrupted. Provide 72 hours' notice to Contracting Officer of activities that will affect National Park Service operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 HISTORIC PRESERVATION TREATMENT PLAN

A. Prepare written plan for preservation work covering preservation components of project. Plan shall verify construction strategy and intent is compatible with Department of the Interior's (DOI) standards for Treatment of Historic Properties, guidelines for Treatment of Cultural Landscapes, and National Park Service management policies for cultural resources. Plan shall satisfy both project scope and resource protection requirements. Plan shall include:

1. Organized list of preservation components of project, systems, and tasks
2. Staging and sequence of work
3. Disassembly and reassembly techniques and steps
4. Equipment and tools required
5. Supplies and materials with manufacturer or supplier identified including specific clean up/storage procedure including frequency and documentation of such.
6. Skilled trades and crafts required
7. Anticipated testing and analysis of fabric
8. Additional investigations for extents or magnitude of treatments needed
9. Protective measures
10. Seasonal limitations on work
11. Alternative means if primary treatment method is unfeasible
12. Work conducted off-site (Approval from Contracting Officer required prior to taking resources off-site).

3.2 PROTECTION, GENERAL

A. Comply with manufacturer's written instructions for precautions and effects of products and procedures on adjacent building materials, components, and vegetation.

B. Ensure supervisory personnel are present when work begins and during progress.

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C. Temporary Protection of Historic Materials during Construction:

1. Protect existing materials during installation of temporary protections and construction. Do not deface or remove existing materials.
2. Attachments of temporary protection to existing construction shall be approved by Contracting Officer prior to installation.

D. Existing Drains: Prior to start of work or cleaning operations, test drains and other water removal systems to ensure drains and systems function properly. Notify Contracting Officer immediately of stopped or blocked drains or systems. Do not begin Work of this Section until drains are in working order.

1. Provide method to prevent solids including stone or mortar residue from entering drains or drain lines. Clean out drains and drain lines blocked or filled because of work performed under this Contract.
2. Protect storm drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.

B. Comply with requirements in Section 01 50 00 "Temporary Facilities and Controls."

C. Cover adjacent surfaces with materials proven to resist chemical cleaners selected for Project unless chemicals being used will not damage adjacent surfaces. Use covering materials containing only waterproof, UV (ultraviolet)-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. Promptly remove masking to prevent adhesive staining on completion.

D. Do not clean surfaces during winds of sufficient force to spread cleaning solutions to unprotected surfaces.

E. Neutralize and collect alkaline and acid wastes and dispose of outside park boundaries.

F. Dispose of runoff from chemical operations by legal means and in a manner preventing soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

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G. Document daily clean-up, proper storage, and disposition of any flammable/combustible materials with daily reports.

3.4 PROTECTION DURING USE OF HEAT-GENERATING EQUIPMENT

A. Comply with following procedures while performing work with heat-generating equipment, including welding, cutting, soldering, brazing, paint removal with heat, and other operations where open flames or implements utilizing heat are used:

1. Obtain Contracting Officer's approval for operations involving use of open-flame or welding equipment.

    a. Notification shall be given for each occurrence and location of work with heat-generating equipment.
    b. Obtain appropriate permit from the park as required.

2. As far as practical, use heat-generating equipment in shop areas or outside building.
3. Before work with heat-generating equipment commences, furnish fire watch (or watches) for location(s) where work is to be performed.
4. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use combustible gas indicator test to ensure area is safe.
5. Remove and keep area free of combustibles, including, rubbish, paper, waste, etc., within area of operations.

    a. If combustible material cannot be removed, provide fireproof blankets to cover such materials.

6. Where possible, furnish and use baffles of metal or gypsum board to prevent spraying of sparks or hot slag into surrounding combustible material.
7. Prevent extension of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
8. Inspect each location of day's work not sooner than 30 minutes after completion of operations to detect hidden or smoldering fires; ensure proper housekeeping is maintained.

B. Where sprinkler protection exists and is functional, maintain without interruption while operations are performed. If operations are performed near automatic sprinkler heads, shield individual heads temporarily with guards.

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3.5 HISTORIC PRESERVATION TREATMENT PROCEDURES

A. The principal aim of preservation work is to halt the process of deterioration and stabilize the item's condition to sustain the integrity of the historic element, feature or structure being preserved. Cyclic maintenance is often required as well as repair work. Repair is required where specifically indicated. The following procedures shall be followed:

1. Retain as much existing material as possible; repair and consolidate rather than replace.
2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
3. Use reversible processes wherever possible.
4. Use traditional replacement materials and techniques if possible. New work shall be distinguishable from old work and original materials and techniques.
5. Record repair work during construction with periodic construction photos and daily inspection reporting. Photo documentation is specified in Section 013233 "Photographic Documentation."

B. Prohibit smoking by personnel performing work on or near historic structures.

C. Notify Contracting Officer of visible changes in integrity of material or components due to environmental causes including biological attack, UV degradation, freezing, or thawing, or due to structural defects including cracks, movement, or distortion.

1. Do not proceed with work in question until directed by Contracting Officer.

D. Where Work requires existing features to be removed, cleaned, and reinstalled, perform operations without damage to material itself, to adjacent materials, or to substrate.

E. Identify new or replacement materials and features with inconspicuous, permanent marks to distinguish from original materials. Record legend of identification marks and locations of these marks on Record Drawings.

F. When cleaning, match samples of existing materials that have been cleaned and identified for acceptable cleaning levels. Avoid over-cleaning to prevent damage. Use gentlest methods available. Initiate cleaning using hand cleaning methods before introducing power cleaning methods and equipment.

END OF SECTION

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements. Quality of work shall be responsibility of the Contractor.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with Contract Document requirements.

C. See Divisions 2 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the work to evaluate actual products incorporated into the work and completed construction comply with requirements.

C. Preconstruction Testing: Tests and inspections performed specifically for project before products and materials are incorporated into work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections performed by a Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing, to establish product performance and compliance with industry standards.

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E. Source Quality Control Testing: Tests and inspections performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality Control Testing: Tests and inspections performed on-site for installation of work and for completed work.

G. Testing Agency or Laboratory: Entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

A. Reference Standards: If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quality levels, comply with most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Contracting Officer before proceeding.

B. Minimum Quality Levels: Quality level shown or specified shall be minimum provided or performed. Actual installation may comply exactly with minimum quality specified, or it may exceed minimum within reasonable limits. To comply with requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Contracting Officer before proceeding.

1.4 SUBMITTALS

A. Quality Control Plan:

1. After contract award and before Pre-Construction conference, submit a written Contractor Quality Control (CQC) plan.
2. If plan requires revisions or corrections, Contractor shall resubmit plan within 10 days.
3. Government reserves the right to require changes in plan during contract period as necessary to obtain the quality specified.

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4. No change in the approved plan may be made without written concurrence by Contracting Officer.

B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in form of a recent report on inspection of testing agency by a recognized authority.

C. Contractor Quality Control (CQC) Daily Reports: Submit showing inspections and tests on first workday following date covered by report. Quality Control Supervisor shall utilize DSC Forms.

1. Review Construction Management Representative (CMR) Daily report if applicable and reconcile any differences prior to posting.

D. Test Reports

1. Test reports shall be completed by person performing test.
2. Submit Daily Test Information Sheets with Quality Control Daily Reports.
3. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
4. Submit three copies of complete test results no later than one calendar day after test was performed.

E. Accessibility Inspection Report:

1. Fill out applicable sections of the Accessibility Inspection Report and attach to Contractor Quality Control Daily Report.
2. Utilize attached Accessibility Inspection form to document compliance with Architectural Barriers Act Accessibility Standards (ABAAS).
3. Inspect at various stages of construction as needed to ensure finished product meets standards.
4. Submit report no later than one calendar day after inspection was performed.

F. Off-Site Inspection Reports: Submit prior to shipment.

G. If Contractor Quality Control plan and Quality Control Daily Reports are not submitted as specified, Contracting Officer may retain payments until such time plan(s) is/are accepted and implemented, or may retain payments for work completed on days with no Quality Control Daily Reports.

H. Permits, Licenses, and Certificates: For National Park Service (NPS) records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices,

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receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Contractors Quality Control Staff:

1. Contractor's Quality Control Supervisor may also perform other duties.
2. Contractor's Quality Control Supervisor shall be assigned no other duties.
3. Contractor's designated Quality Control Supervisor shall be on the project site whenever contract work is in progress.
4. Contractor's job supervisory staff may be used to assist Quality Control Supervisor supplemented, as necessary, by additional certified testing technicians.

C. Installer Qualifications: Firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent indicated for Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: Firm experienced in manufacturing products or systems similar to those indicated for Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Fabricator Qualifications: Firm experienced in producing products similar to those indicated for Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

F. Professional Engineer Qualifications: Professional engineer legally qualified to practice in jurisdiction where Project is located and is experienced in providing engineering services of kind indicated (including Structural Tests and Special Inspections (STSI)). Engineering services are defined as those performed for installations of system, assembly, or products similar to those indicated for Project in material, design, and extent.

G. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing Work.

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H. Testing Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or an independent agency with experience and capability to conduct testing and inspecting indicated, according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by Contract, is acceptable to Contracting Officer.

1. Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7 (Code of Federal Regulations).
2. National Voluntary Laboratory Accreditation Program (NVLAP): Testing agency accredited according to National Institute of Standards and Technology's (NIST) National Voluntary Laboratory Accreditation Program.
3. Measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NIST requirements. Measuring and testing devices shall be made available for use by Government for verification tests.

I. Factory-Authorized Service Representative Qualifications: Authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products similar in material, design, and extent to those indicated for Project.

J. Mockups: Before installing portions of work requiring mockups, build mockups for each form of construction and finish required to comply with following requirements, using materials indicated for completed work:

1. Build mockups in location and of size indicated; if not indicated, as directed by Contracting Officer.
2. Notify Contracting Officer seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate proposed range of aesthetic effects and workmanship.
4. Obtain Contracting Officer's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups in an undisturbed condition as a standard for judging the completed work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 49.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

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1.6 QUALITY CONTROL

A. Contractor is responsible for testing and inspections, including Structural Tests and Special Inspections (STSI), as identified in attached STSI. Inspect and test work as needed to ensure quality of materials, workmanship, construction, finish, and functional performance are in compliance with applicable specifications, drawings, and those required by the Building Code.

1. Engage qualified testing agency to perform quality-control services.
2. Submit appropriate report for each quality-control service.
3. Testing and inspecting requested by Contractor and not required by Contract Documents are Contractor's responsibility.
4. Contracting Officer may designate test locations.

B. Manufacturer's Field Services: Where indicated, engage factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

C. Re-testing/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction of replaced work that failed to comply with Contract Documents.

D. Testing Agency Responsibilities: Cooperate with NPS and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Contracting Officer and Contractor promptly of irregularities or deficiencies observed in work during performance of services.
2. Determine location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, State in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit 3 copies of certified written report of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of Work.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide:

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1. Access to Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for material mixes that require control by testing agency.
7. Security and protection for samples and testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with minimum delay and to avoid removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

2.1 QUALITY CONTROL PLAN

A. Quality Control Plan shall include:

1. List of personnel responsible for quality control and assigned duties. Include each person's qualifications. Include alternate(s) and qualifications.
2. Copy of letter of direction to Contractor's Quality Control Supervisor(s) outlining assigned duties and authorities designated by principal or owner.
3. Names, qualifications / accreditations, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms from laboratories.
4. Methods of performing, documenting, and enforcing quality control of work including Contractor report forms and acknowledgment of NPS forms.
5. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.
6. Specific discussion regarding mockups, off-site visits, receiving inspections, manufacturers representation, startup requirements, and other aspects of performance specific to Project.
7. Provisions for substantial completion(s) and final inspection(s) per Contract.

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PART 3 - EXECUTION

3.1 OFF-SITE CONTROL

A. Items fabricated or assembled off-site shall be inspected for quality control at place of fabrication.

3.2 ON-SITE CONTROL

A. Notification:

1. Notify Contracting Officer at least 48 hours in advance of preparatory phase meeting.
2. Notify Contracting Officer at least 24 hours in advance of initial and follow-up phases.

B. Preparatory Phase: Perform before beginning each feature of work.

1. Review control submittal requirements with personnel directly responsible for quality assurance and quantity control of the work. As a minimum, Contractor's Quality Control Supervisor and foreman responsible for feature of work shall be in attendance.
2. Review applicable specifications sections and drawings related to feature of work.
3. Ensure copies of referenced standards related to sampling, testing, and execution for feature of work are available on site.
4. Ensure provisions have been made for field control testing.
5. Examine work area to ensure preliminary work has been completed.
6. Verify field dimensions and advise Contracting Officer of discrepancies with contract documents.
7. Ensure necessary equipment and materials are at project site and they comply with approved shop drawings and submittals.
8. Document preparatory phase activities and discussions on Contractor's Quality Control Daily Report.

C. Initial Phase:

1. As soon as work begins, inspect and test representative portion of particular feature of work for quality of workmanship.
2. Review control testing procedures to ensure compliance with contract requirements.
3. Document initial phase activities and discussions on Contractor's Quality Control Daily Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

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D. Follow-Up Phase: Inspect and test as work progresses to ensure compliance with contract requirements until completion of work.

E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be required on same feature of work for following reasons:

1. Quality of on-going work is unacceptable.
2. Changes in quality control staff, on-site production supervision, or work crew.
3. Work on particular feature of work is resumed after substantial period of inactivity.

3.3 DOCUMENTATION

A. Maintain Quality Control Daily Reports, Daily Test Report Information Sheets, and Accessibility Inspection Reports of quality control activities and tests. (Download from DSC Workflows website > Forms/Templates/Samples/Guidelines page > Construction Forms section.)

B. Quality Control Daily Reports shall not be substituted for other written reports required under clauses of contract, such as Disputes, Differing Site Conditions, or Changes.

C. Quality Control Daily Reports shall accurately portray all work and materials. The materials shall match the materials as approved from the Construction Documents (CD) requirements. Combustible/flammable materials shall be documented as well.

3.4 ENFORCEMENT

A. Contractor shall stop work on any item or feature pending satisfactory correction of deficiency noted by quality control staff or Contracting Officer.

3.5 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams as invisible as possible.
2. Comply with Contract Document requirements for Section 01 73 29 "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

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C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 01 42 00 – REFERENCE STANDARDS

PART 1 - GENERAL

1.1 ENVIRONMENTAL DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114 and as specified herein.

B. Biobased Materials: As defined in the Farm Security and Rural Investment Act, for purposes of Federal procurement of biobased products, "biobased" means a "commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials." Biobased materials also include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000.

1. Biobased content: Amount of biobased carbon in the material or product as a percentage of weight (mass) of total organic carbon in the material or product.

C. Chain-of-Custody: Process whereby a product or material is maintained under physical possession or control during its entire life cycle.

D. Deconstruction: Disassembly of buildings for purpose of recovering materials.

E. DFE (Design for the Environment): A technique that includes elements of resource conservation and pollution prevention as applied in various product sectors. A technique that incorporates approaches which are part of product (or assembly) concept, need and design. Considerations involve material selection, material and energy efficiency, reuse, maintainability and design for disassembly and recyclability. Refer to International Organization for Standardization (ISO) Guide 64 for additional clarification.

F. Environmentally preferable products: Products and services that have a lesser or reduced effect on the environment in comparison to conventional products and services. Refer to EPA's Final Guidance on Environmentally Preferable Purchasing Program.

G. Non-Renewable Resource: A resource that exists in a fixed amount that cannot be replenished on a human time scale. Non-renewable resources have potential for renewal only by geological,

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physical, and chemical processes taking place over of millions of years. Examples include iron ore, coal, and oil.

H. Perpetual Resource: A resource that is virtually inexhaustible on a human time scale. Examples include solar energy, tidal energy, and wind energy.

I. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock. Recycled content claim shall be consistent Federal Trade Commission (FTC) Guide for Use of Environmental Marketing Claims.

J. Renewable Resource: A resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource. A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include trees in forests, grasses in grasslands, and fertile soil.

1.2 QUALITY ASSURANCE

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents to the extent referenced. Such standards are made a part of Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified, and standards may establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Contracting Officer (CO) for decision before proceeding.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless Contract Documents include more stringent requirements, applicable construction industry standards have same force and effect as if bound or copied directly into Contract Documents to the extent referenced. Such standards are made a part of Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of Contract Documents unless otherwise indicated.

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C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities found in Section 01 42 00 Sources for Reference Publications, Unified Facilities Guide Specifications (UFGS) (accessible via Masters website > Downloads section > click on UFGS Master (WBDG Website). Names, telephone numbers, and websites are subject to change and are believed to be accurate and up-to-date as of date of Contract Documents.

XX	EXAMPLE Association (The) www.EXAMPLE.org	

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in following list. Names, telephone numbers, and websites are subject to change and are believed to be accurate and up-to-date as of date of Contract Documents.

DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-3003
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. icc-es.org	(800) 423-6587 (562) 699-0543

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C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in following list. Names, and websites are subject to change and are believed to be accurate and up-to-date as of date of Contract Documents.

ABA & ABAAS United States Access Board	Architectural Barriers Act (ABA) Architectural Barriers Act Accessibility Standards (ABAAS) www.access-board.gov
CoE	Army Corps of Engineers www.usace.army.mil
CPSC	Consumer Product Safety Commission www.cpsc.gov
DOC	Department of Commerce www.commerce.gov
DOD	Department of Defense www.defense.gov
DOJ	Department of Justice www.justice.gov
DOE	Department of Energy www.energy.gov
EPA	Environmental Protection Agency www.epa.gov
FAA	Federal Aviation Administration www.faa.gov
FCC	Federal Communications Commission www.fcc.gov
FDA	Food and Drug Administration www.fda.gov

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GSA	General Services Administration www.gsa.gov
HUD	Department of Housing and Urban Development www.hud.gov
LBL	Lawrence Berkeley National Laboratory www.lbl.gov
NCHRP	National Cooperative Highway Research Program (See TRB (Transportation Resource Board))
NIST	National Institute of Standards and Technology www.nist.gov
OSHA	Occupational Safety & Health Administration www.osha.gov
PHS	U.S. Department of Health and Human Services www.hhs.gov
RUS	Rural Utilities Service (See USDA (Department of Agriculture))
SD	State Department www.state.gov
TRB	Transportation Research Board www.nationalacademies.org/trb/transportation-research-board
USDA	Department of Agriculture www.usda.gov
USP	U.S. Pharmacopeia www.usp.org
USPS	Postal Service www.usps.com

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D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in following list. Names, telephone numbers, and websites are subject to change and are believed to be accurate and up-to-date as of date of Contract Documents.

ABAAS	Architectural Barriers Act Accessibility Standards www.access-board.gov
CFR	Code of Federal Regulations Available from Government Printing Office www.govinfo.gov/app/collection/cfr
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/
DSCC	Defense Supply Center Columbus (See FS (Federal Specification))
FED-STD	Federal Standard (See FS (Federal Specification))
FS	Federal Specification Available from Department of Defense Single Stock Point www.dsp.dla.mil/Specs-Standards/ Available from General Services Administration www.gsa.gov Available from National Institute of Building Sciences www.nibs.org
FTMS	Federal Test Method Standard (See FS (Federal Specification))
MIL	(See MILSPEC (Military Specification and Standards))
MIL-STD	(See MILSPEC (Military Specification and Standards))
MILSPEC	Military Specification and Standards

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Available from Department of Defense Single Stock Point
www.dsp.dla.mil/Specs-Standards/

UFAS Uniform Federal Accessibility Standards
Available from Access Board
www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/ufas
*(UFAS is **only** for housing projects per Fair Housing Act. See also the Fair Housing Act Design Manual, www.huduser.gov/portal/publications/destech/fairhousing)*

1.5 ENVIRONMENTAL REFERENCE STANDARDS

A. American Forest and Paper Association:

1. Sustainable Forestry Initiative

B. American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE):

- ASHRAE 52.2, *Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size*
- ASHRAE 55, *Thermal Environmental Conditions for Human Occupancy*
- ASHRAE 62.1, *Ventilation for Acceptable Indoor Air Quality*
- ASHRAE 62.2, *Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings*
- ASHRAE/IESNA 90.1, *Energy Standard for Buildings, Except Low-Rise Residential Buildings*
- ASHRAE 90.2, *Energy Efficient Design of Low-Rise Residential Buildings*

C. American Association of State Highway and Transportation Officials (AASHTO):

- M288 Geotextile Specification for Highway Applications
- MP009-06 Standard Specification for Compost for Erosion/Sediment Control (Filter Berms and Filter Socks)
- MP010-03 Standard Specification for Compost for Erosion/Sediment Control (Compost Blankets)

D. American Society for Testing and Materials International (ASTM):

- A478 Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire
- A580/A580M Standard Specification for Stainless Steel Wire
- A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

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- B813 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
- C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
- C128 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
- C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C1319 Standard Specification for Concrete Grid Paving Units
- C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
- C1386 Standard Specification for Precast Autoclaved AERATED Concrete (PAAC) Wall Construction Units
- C1483 Standard Specification for Exterior Solar Radiation Control Coatings on Buildings
- C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
- C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces
- C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
- C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
- C33 Standard Specification for Concrete Aggregates
- C593 Standard Specification for Fly Ash and Other Pozzolans for Use With Lime
- C595 Standard Specification for Blended Hydraulic Cements
- C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
- C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
- C739 Standard Specification for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation
- C936 Standard Specification for Interlocking Concrete Paver Units
- C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
- D1435 Standard Practice for Outdoor Weathering of Plastics
- D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 foot pound force per cubic foot (ft-lbf/ft3) (2,700 kilonewton meter per cubic meter (kN-m/m3))

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- D1972 Standard Practice for Generic Marking of Plastic Products
- D198 Standard Test Methods of Static Tests of Lumber in Structural Sizes
- D2103 Standard Specification for Polyethylene Film and Sheeting
- D217 Standard Test Methods for Cone Penetration of Lubricating Grease
- D2369 Standard Test Method for Volatile Content of Coatings
- D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
- D3792 Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
- D3864 Standard Guide for Continual On-Line Monitoring Systems for Water Analysis
- D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- D4017 Standard Test Method for Water in Paints and Paint Materials by Karl Fischer Method
- D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- D4444 Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters
- D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- D4552 Standard Practice for Classifying Hot-Mix Recycling Agents
- D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- D4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
- D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Product
- D4840 Standard Guide for Sampling Chain-of-Custody Procedures
- D4887 Standard Test Method for Preparation of Viscosity Blends for Hot Recycled Bituminous Materials
- D5106 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
- D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
- D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
- D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- D5268 Standard Specification for Topsoil Used for Landscaping Purposes
- D5359 Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
- D5505 Standard Practice for Classifying Emulsified Recycling Agents
- D5509 Standard Practice for Exposing Plastics to a Simulated Compost Environment

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- D5512 Standard Practice for Exposing Plastics to a Simulated Compost Environment Using an Externally Heated Reactor
- D5539 Standard Specification for Seed Starter Mix
- D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations
- D5603 Standard Classification for Rubber Compounding Materials—Recycled Vulcanizate Particulate Rubber
- D5663 Standard Guide for Validating Recycled Content in Packaging Paper and Paperboard
- D5759 Standard Guide for Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
- D5792 Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
- D5834 Standard Guide for Source Reduction Reuse, Recycling, and Disposal of Solid and Corrugated Fiberboard (Cardboard)
- D5851 Standard Guide for Planning and Implementing a Water Monitoring Program
- D5852 Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
- D6002 Standard Guide for Assessing the Compostability of Environmentally Degradable Plastics
- D6006 Standard Guide for Assessing Biodegradability of Hydraulic Fluid
- D6007 Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber
- D6046 Standard Classification of Hydraulic Fluids for Environmental Impact
- D6081 Standard Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation
- D6108 Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
- D6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber
- D6112 Standard Test Methods for Compressive and Flexural creep and Creep-Rupture of Plastic Lumber and Shapes
- D6117 Standard Test Methods for Mechanical Fasteners In Plastic Lumber and Shapes
- D6155 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures
- D6245 Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
- D6261 Standard Specification for Extruded and Compression Molded Basic Shapes Made from Thermoplastic Polyester (TPES)
- D6262 Standard Specification for Extruded, Compression Molded, and Injection Molded Basic Shapes of Poly(aryl ether ketone) (PAEK)

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- D6270 Standard Practice for Use of Scrap Tires in Civil Engineering Applications
- D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers
- D6330 Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
- D6345 Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air
- D6400 Standard Specification for Compostable Plastics
- D6435 Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes
- D6629 Standard Guide for Selection of Methods for Estimating Soil Loss by Erosion
- D6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards
- D6712 Standard Specification for Ultra-High-Molecular-Weight Polyethylene (UHMW-PE) Solid Plastic Shapes
- D6886 Standard Test Method for Speciation of the Volatile Organic Compounds (VOCs) in Low VOC Content Waterborne Air-Dry Coatings by Gas Chromatography
- D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
- D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
- D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
- D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
- E1021 Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells
- E1038 Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls
- E1039 Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation
- E1040 Standard Specification for Physical Characteristics of Nonconcentrator Terrestrial Photovoltaic Reference Cells
- E1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- E1171 Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments
- E1333 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Under Defined Test Conditions Using a Large Chamber

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- E1362 Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells
- E1433 Standard Guide for Selection of Standards on Environmental Acoustics
- E1462 Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules
- E1596 Standard Test Methods for Solar Radiation Weathering of Photovoltaic Modules
- E1597 Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments
- E1609 Standard Guide for Development and Implementation of a Pollution Prevention Program
- E1686 Standard Guide for Selection of Environmental Noise Measurements and Criteria
- E1690 Standard Test Method for Determination of Ethanol Extractives in Biomass
- E1721 Standard Test Method for Determination of Acid-Insoluble Residue in Biomass
- E1755 Standard Test Method for Ash in Biomass
- E1758 Standard Test Method for Determination of Carbohydrates in Biomass by High Performance Liquid Chromatography
- E1780 Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source
- E1799 Standard Practice for Visual Inspections of Photovoltaic Modules
- E1802 Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules
- E1821 Standard Test Method for Determination of Carbohydrates in Biomass by Gas Chromatography
- E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
- E1830 Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules
- E1861 Standard Guide for Use of Coal Combustion By-Products in Structural Fills
- E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
- E1971 Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings
- E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
- E1991 Standard Guide for Environmental Life Cycle Assessment of Building Materials/Products
- E2047 Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays
- E2114 Standard Terminology for Sustainability Relative to the Performance of Buildings
- E2128 Standard Guide for Evaluating Water Leakage of Building Walls

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- E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
- E2397 Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems
- E2398 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems
- E2399 Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems
- E2400 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems
- E241 Standard Guide for Limiting Water-Induced Damage to Buildings
- E2432 Standard Guide for General Principles of Sustainability Relative to Buildings
- E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
- E413 Standard Classification for Rating Sound Insulation
- E477 Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
- E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- E683 Standard Practice for Installation and Service of Solar Space Heating Systems for One- and Two-Family Dwellings
- E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
- E781 Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
- E782 Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
- E823 Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
- E881 Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode
- E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
- E948 Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
- F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- F2034 Standard Specification for Sheet Linoleum Floor Covering

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- F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

E. Bat Conservation International:

- Bat Approved Bat Houses

F. Carpet and Rug Institute

- Green Label & Green Label Plus Testing Programs, carpet-rug.org/testing/green-label-plus

G. Center for Resource Solutions

- Green-e program

H. Environmental Protection Agency (EPA):

- Comprehensive Procurement Guidelines
- ENERGY STAR
- Environmentally Preferable Purchasing Program Final Guidance
- GreenScapes program
- Heat Island Initiative
- Indoor Air Quality Building Education and Assessment Model (I-BEAM)
- National Environmental Performance Track
- Pollution Prevention (P2)
- Product Stewardship Program
- Significant New Alternatives Policy (SNAP) Program

I. Federal Trade Commission:

- Guide for the Use of Environmental Marketing Claims

J. Forest Stewardship Council:
- Chain-Of-Custody
- Forest Management

K. Green Building Initiative (GBI):

- Green Globes - US

L. Green Seal:

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- GC-03 Anti-Corrosive Paints
- GC-12 Occupancy Sensors
- GC-13 Split-Ductless Air-Source Heat Pumps
- GS-05 Compact Fluorescent Lamps
- GS-11 Paints
- GS-13 Windows
- GS-14 Window Films
- GS-31 Electric Chillers
- GS-32 Photovoltaic Modules
- GS-36 Commercial Adhesives
- GS-37 Industrial & Institutional Cleaners

M. International Iron and Steel Institute:

- CO2 Breakthrough Program

N. International Organization of Standardization:

- Guide 64; Guide for Inclusion of Environmental Aspects in Product Standards
- 9660 Information processing -- Volume and file structure of CD-ROM for information interchange
- 14001 Environmental management systems – Specification with guidance for use
- 14004 Environmental Management Systems – General Guidelines on Principles, Systems and Supporting Techniques
- 14020 Environmental labels and declarations – General principles
- 14024 Environmental labels and declarations – Type I environmental labelling - Principles and procedures
- 14040 Environmental management – Life cycle assessment – Principles and framework

O. National Association of Home Builders:

- Advanced Framing Techniques: Optimum Value Engineering

P. National Institute of Building Sciences:

- MOIST program for transfer of heat and moisture
- Whole Building Design Guide

Q. National Institute of Standards and Technology:

- BEES (Building for Environmental and Economic Sustainability) Lifecycle Decision Support Tool

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R. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

- IAQ Guidelines for Occupied Buildings Under Construction

S. Southcoast Air Quality Management District:

- 1168 Adhesive and Sealant Applications

T. US Composting Council:

- Seal of Testing Assurance Program

U. US Department of Agriculture:

- Biobased Products – Definitions and Descriptions

V. US Green Building Council:

- LEED™ 2009 Green Building Rating System
- LEED™ v4 (version 4) Green Building Rating System

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 015719.11 – INDOOR AIR QUALITY MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Special requirements for Indoor Air Quality (IAQ) management during construction operations.

    a. Control of emissions during construction.
    b. Moisture control during construction.

2. Procedures for testing baseline IAQ. Baseline IAQ requirements, specify maximum indoor pollutant concentrations for acceptance of the facility.

1.2 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114.

B. Adequate ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. Hazardous Materials: Any material regulated as a hazardous material in accordance with 49 CFR 173 (Code of Federal Regulations), requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1. Hazardous materials include pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

D. Indoor Air Quality (IAQ): Composition and characteristics of air in an enclosed space that affect occupants of that space. Indoor air quality of a space refers to relative quality of air in a building

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with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including impact on thermal comfort such as air temperature, relative humidity and air speed.

E. Interior final finishes: Materials and products exposed to interior occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.

F. Packaged dry products: Materials and products installed in dry form delivered in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.

G. Wet products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and materials which require curing.

1.3 QUALITY ASSURANCE

A. Inspection and Testing Lab Qualifications: Minimum of 5 years of experience in performing types of testing specified herein.

1.4 SUBMITTALS

A. Indoor Air Quality (IAQ) Management Plan: After award and before Pre-construction conference, prepare and submit IAQ Management Plan, including:

1. Procedures for control of emissions during construction.

    a. Identify schedule for application of interior finishes: Identify each interior finish that generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors. Indicate air handling zone, sequence of application, and curing times.
    b. Identify potential sources of odor and dust.
    c. Identify construction activities likely to produce odor or dust.
    d. Identify areas of project potentially affected, especially occupied areas.
    e. Evaluate potential problems by severity and describe methods of control.
    f. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent Heating HVAC systems, types of filters and schedule for replacement of filters.
    g. Describe cleaning and dust control procedures.
    h. Describe coordination with commissioning procedures.

2. Procedures for moisture control during construction.

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a. Identify porous materials and absorptive materials.
b. Identify schedule for inspection of stored and installed porous and absorptive materials.

3. Revise and resubmit Plan as required by Contracting Officer (CO).

a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

B. Product Data:

1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
2. Material Safety Data Sheets (MSDS): Submit MSDSs for inclusion in Operation and Maintenance Manual for:

a. Adhesives
b. Floor and wall patching/leveling materials
c. Caulking and sealants
d. Insulating materials
e. Fireproofing and firestopping
f. Carpet
g. Paint
h. Clear finish for wood surfaces
i. Lubricants
j. Cleaning products

C. Inspection and Test Reports:

1. Moisture control inspections
2. Moisture content testing
3. Moisture penetration testing
4. Microbial Growth testing

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 IAQ MANAGEMENT - EMISSIONS CONTROL

A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied Buildings under Construction.

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B. HVAC Protection:

1. Seal return registers during construction operations.
2. Provide temporary exhaust during construction operations.
3. To greatest extent possible, isolate and/or shut down return side of HVAC system during construction. When ventilation system must be operational during construction activities, provide temporary filters at air inlets (returns) and at locations for filters prescribed in the design.
4. Contractor shall bear cost of cleaning required due to failure to protect ducts and equipment from construction dust.

C. Source Control: Provide low and zero VOC materials as specified.

D. Pathway Interruption: Isolate areas of work to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.

E. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.

F. Temporary Ventilation: For materials/products that generally require ventilation for off gassing, provide an ACH (air changes per hour) of 1.5 or more and as follows:

1. Provide minimum 48-hour pre-ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees Fahrenheit minimum to 90-degree Fahrenheit maximum continuously during ventilation period. Do not ventilate within limits of Work unless otherwise approved by Contracting Officer.
2. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.
3. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction and a MERV as described in the construction documents during NPS occupancy. Coordinate with work of Division 23 (15), Heating Ventilating and Air Conditioning (HVAC).

G. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.

H. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cubic feet. of outdoor air per square feet of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and relative humidity no higher than 60%.

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1. Obtain Contracting Officers concurrence that construction is complete enough before beginning flush-out.
2. If additional construction involving materials that produce particulates or any of specified contaminants is conducted during or after flush-out, then flush-out process must be restarted.
3. Install new HVAC filtration media in locations identified to have permanent filtration in contract documents after completion of flush-out and before occupancy or further testing.

3.2 IAQ MANAGEMENT - MOISTURE CONTROL

A. Housekeeping:

1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
2. Verify installed materials and products are dry prior to sealing and weatherproofing building envelope.
3. Store interior absorptive materials only after building envelope is sealed and weatherproofed.

B. Inspections: Document and report results of inspections; state whether or not inspections indicate satisfactory conditions.

1. Examine materials for dampness as they arrive. If acceptable to Contracting Officer, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
3. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
4. HVAC: Inspect HVAC system as specified in Section on Commissioning. And, inspect HVAC to verify:

    a. condensate pans are sloped and plumbed correctly;
    b. access panels are installed to allow for inspection and cleaning of coils and ductwork downstream of coils;
    c. ductwork and return plenums are air sealed;
    d. duct insulation is installed and sealed; and
    e. chilled water line and refrigerant line insulation are installed and sealed.

C. Schedule:

1. Schedule work such that absorptive materials, such as porous insulations, paper-faced

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gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water.

2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air barriers, flashing, exterior sealants and roofing, at earliest possible time.

D. Testing for Moisture Content: Test moisture content of porous materials and absorptive materials to ensure they are dry before sealing them into an assembly. Document and report results of testing. Where tests are not satisfactory, dry materials and retest. If satisfactory results cannot be obtained with retest, remove and replace with new materials.

END OF SECTION

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SECTION 015719.12 – NOISE AND ACCOUSTICS MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Special requirements for noise and acoustics management during renovation operations.

1.2 DEFINITIONS

A. Ambient noise level: The total noise associated with a given environment, being usually a composite of normal or existing sounds from all sources near and far, excluding the noise source at issue.

B. Daytime: The hours from 7:00AM to 4:30PM on weekdays and 9 A.M. to 9 P.M. on weekends and holidays.

C. Nighttime: All non-daytime hours.

D. Property line: The real or imaginary line along the ground surface and its vertical extension, which separates real property owned or controlled by one person from contiguous real property owned or controlled by another person or from any public right-of-way or from any public space.

E. Receiving noise area: Any real property where people live or work and where noise is heard, excluding the project or source area.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 NOISE MANGEMENT

A. Noise Control: Perform renovation operations to minimize noise. Perform noise-producing work in less sensitive hours of the day or week as directed by the Contracting Officer CO).

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B. Repetitive and/or intermittent, high-level noise: Permitted only during Daytime.

1. Do not exceed the following dB(A) limitations at 50 feet:

Sound Level in dB(A)	Time Duration of Impact Noise
70	More than 12 minutes in any hour
80	More than 3 minutes in any hour

2. Maximum permissible construction equipment noise levels at 50 feet:

EARTHMOVING	dB(A)	MATERIALS HANDLING	dB(A)
Front Loaders	75	Concrete Mixers	75
Backhoes	75	Concrete Pumps	75
Dozers	75	Cranes	75
Tractors	75	Derricks Impact	75
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers, Stationary	80	Pneumatic Tools	80
Pumps	75	Saws	75
Generators	75	Vibrators	75
Compressors	75		

C. Ambient Noise:

1. Maximum noise levels (dB (decibel)) for receiving noise area at property line shall be as follows:

a. Residential receiving area
Daytime: 65 dB
Nighttime: 45 dB

b. Commercial/Industrial receiving area
Daytime: 67 dB
Nighttime: 65 dB

c. In the event the existing local ambient noise level exceeds the maximum allowable receiving noise level (dB), the receiving noise level maximum for construction operations shall be adjusted as follows:

d. Residential receiving area: Maximum 3 additional dB above the local ambient as measured at property line.

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e. Commercial/Industrial receiving area: Maximum 5 additional dB above the local ambient as measured at the property line.

3.2 FIELD QUALITY CONTROL

A. Assess potential effects of construction noise on adjacent neighbors and facility occupants in accordance with ASTM E1686 and as follows:

1. Ambient noise measurement: Measure at property line at a height of at least four (4) feet above the immediate surrounding surface. Average the ambient noise level over a period of at least 15 minutes.
2. Ambient noise measurement at urban sites: Conduct during morning peak traffic hour between 7 A.M. and 9 A.M. and afternoon peak traffic hour between 4 P.M. and 6 P.M. In addition, conduct a 24-hour measurement at the proposed project site to document the noise pattern throughout the day. Adjust and weight for seasonal and climatic variations.

B. Monitor noise produced from construction operations in accordance with ASTM E1780.

END OF SECTION

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SECTION 016700 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and environmental requirements.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, current as of date of Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a product substitution, to have indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Definitions pertaining to sustainable development: As defined in ASTM E2114.

C. Biobased Materials: As defined in Farm Security and Rural Investment Act, for purposes of Federal procurement of biobased products, "biobased" means a "commercial or industrial product (other than food or feed) composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials." Biobased materials also include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000.

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1. Biobased content: Amount of biobased carbon in material or product as a percentage of weight (mass) of total organic carbon in material or product.

D. Chain-of-Custody: Process whereby a product or material is maintained under physical possession or control during its entire life cycle.

E. Environmentally preferable products: Products and services with lesser or reduced effect on the environment in comparison to conventional products and services. Refer to Environmental Protection Agency's (EPA) Final Guidance on Environmentally Preferable Purchasing for more information.

F. Stewardship: Responsible use and management of resources in support of sustainability.

G. Sustainability: Maintenance of ecosystem components and functions for future generations.

1. Recycled Content Materials: Products containing pre-consumer or post-consumer materials as all or part of their feedstock. Recycled content claim shall be consistent with International Organization for Standardization (ISO) 140001 Standard for the Use of Environmental Marketing Claims.
2. Rapidly Renewable Material: Material made from plants typically harvested within a ten-year cycle.
3. Regional Materials: Materials manufactured and extracted, harvested, or recovered within a radius of 500 miles from Project location.

1.3 SUBMITTALS

A. Record Submittals as specified in – Sustainable Design Close-Out Documentation, submit:

1. Affirmative Procurement Reporting Form. Submit on form in Appendix A of this Section, or similar form as approved by Contracting Officer (CO).
2. Submit environmental data in accordance with Table 1 of ASTM E2129 for these products:

a. Joint Sealers
b. Gypsum Board
c. Paints & Coatings
d. HVAC equipment
e. Lighting equipment

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3. Material Safety Data Sheets (MSDS): For each product required by OSHA to have a MSDS, submit an MSDS. MSDS shall be prepared within the previous five years. Include information for MSDS Sections 1 to 16 in accordance with ANSI Z400.1 and as follows:

    a. Section 1: Chemical Product and Company Identification
    b. Section 2: Composition/Information on Ingredients
    c. Section 3: Hazards Identification
    d. Section 4: First Aid Measures
    e. Section 5: Fire Fighting Measures
    f. Section 6: Accidental Release Measures
    g. Section 7: Handling and Storage
    h. Section 8: Exposure Controls/Person Protection
    i. Section 9: Physical and Chemical Properties
    j. Section 10: Stability and Reactivity Data
    k. Section 11: Toxicological Information. Include data used to determine the hazards cited in Section 3. Identify acute data, carcinogenicity, reproductive effects, and target organ effects.
    l. Section 12: Ecological Information. Include data regarding environmental impacts during raw materials acquisition, manufacture, and use. Include data regarding environmental impacts in event of accidental release.
    m. Section 13: Disposal Considerations. Include data regarding proper disposal of the chemical. Include information regarding recycling and reuse. Indicate whether or not product is considered to be "hazardous waste" according to United States EPA Hazardous Waste Regulations 40 CFR 261 (Code of Federal Regulations).
    n. Section 14: Transportation Information. Identify hazard class for shipping.
    o. Section 15: Regulatory Information. Identify federal, state, and local regulations applicable to the material.
    p. Section 16: Other Information. Include additional information relative to recycled content, biobased content, and other information regarding environmental and health impacts. Identify the date MSDS was prepared.

4. Chain of Custody: Submit chain-of-custody documentation for sustainable forestry for these products:

    a. Rough Carpentry
    b. Finish Carpentry
    c. Wood Doors
    d. Windows
    e. Wood Flooring
    f. Furnishings & Accessories

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1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in undamaged condition; in manufacturer's original sealed container or other packaging system; complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with Contract Documents. Ensure products are undamaged and properly protected.
5. Obtain materials in biodegradable or recyclable/reusable packaging which uses minimum amount of packaging possible.

C. Storage:

1. Allow for inspection and measurement of quantity or counting of units.
2. Store materials in manner to not endanger Project structure.
3. Store products subject to damage by the elements, under cover in weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter.

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1.6 PACKAGING

A. Where Contractor has option to provide one of listed products or equal, preference shall be given to products with minimal packaging and easily recyclable packaging as defined in ASTM D5834.

B. Maximize use of source reduction and recycling procedures outlined in ASTM D5834.

C. Provide minimum 45 percent post-consumer recycled content and minimum 100 percent recovered fiber content of industrial paperboard in accordance with EPA's Comprehensive Procurement Guidelines and ASTM D5663.

D. Provide minimum 10 percent post-consumer recycled content and minimum 10 percent recovered fiber content of carrier board in accordance with EPA's Comprehensive Procurement Guidelines and ASTM D5663.

E. Provide minimum 20 percent post-consumer recycled content and minimum 40 percent recovered fiber content of brown papers (e.g., wrapping papers and bags) in accordance with EPA's Comprehensive Procurement Guidelines and ASTM D5663.

1.7 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. Provide environmentally preferable products to greatest extent possible.

1. To greatest extent possible, provide products and materials with a lesser or reduced effect on the environment considering raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and/or disposal of the product.
2. Eliminate use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either Montreal Protocol and Title VI or Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account life cycle impacts.
3. Use products meeting or exceeding EPA's recycled content recommendations for EPA-designated products. Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of total value of the materials in project.

1.8 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by Contract Documents. Manufacturer's disclaimers and limitations on

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product warranties do not relieve Contractor of obligations under requirements of Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for product specifically endorsed by manufacturer to Government.
2. Special Warranty: Written warranty required by or incorporated into Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Government.

B. Special Warranties: Prepare written document containing appropriate terms and identification, ready for execution. Submit draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with Specifications, prepare written document using appropriate form properly executed.
3. Refer to Divisions 2 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products to comply with Contract Documents, undamaged and, unless otherwise indicated, new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types produced and used successfully in similar situations on other projects.
3. Government reserves right to limit selection to products with warranties not in conflict with requirements of Contract Documents.
4. Where products are accompanied by term "as selected," Contracting Officer will make selection.
5. Where products are accompanied by term "match sample," sample to be matched is Governments.

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6. Descriptive, performance, and reference standard requirements in Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name single product and manufacturer, provide named product that complies with requirements or approved equal.
2. Manufacturer/Source: Where Specifications name single manufacturer or source, provide product by named manufacturer or source that complies with requirements or approved equal.
3. Products: Where Specifications include list of names of both products and manufacturers, provide one of the products listed that complies with requirements or approved equal.
4. Manufacturers: Where Specifications include list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements or approved equal.
5. Available Products: Where Specifications include list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide specified product, system, or approved equal.
8. Basis-of-Design Product: Where Specifications name product and include a list of manufacturers, provide specified product or a comparable product by one of the other named manufacturers, or approved equal. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics based on the product named.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select product that complies with requirements and matches Contracting Officer's sample. Contracting Officers decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

10. Visual Selection Specification: Where Specifications include phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

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a. Standard Range: Where Specifications include phrase "standard range of colors, patterns, textures" or similar phrase, Contracting Officer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
b. Full Range: Where Specifications include phrase "full range of colors, patterns, textures" or similar phrase, Contracting Officer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions: Contracting Officer will consider Contractor's request for comparable product when the following conditions are satisfied. If following conditions are not satisfied, Contracting Officer will return requests without action, except to record noncompliance with these requirements:

1. Evidence proposed product does not require revisions to Contract Documents, that it is consistent with Contract Documents and will produce indicated results and is compatible with other portions of Work.
2. Detailed comparison of significant qualities of proposed product with those named in Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

3.1 PROTECTION AFTER INSTALLATION

A. Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

END OF SECTION

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AFFIRMATIVE PROCUREMENT REPORTING FORM
Recycled Content Materials & Biobased Content Materials

Project Name: _____ Project Number: _____

Contractor Name: _____ License Number: _____

Contractor Address: ___

Product	Total $ value provided	Total $ value with recycled content Pre-consumer	Total $ value with recycled content Post-consumer	Total $ value with biobased content	Exempted indicate 1,2,3,4	Comments
Hydraulic Mulch (paper based)						
Hydraulic Mulch (wood based)						
Compost						
Parking Stops (Concrete w/ fly ash, slag cement or low cement content)						
Parking Stops (Plastic/Rubber)						
Patio Blocks/Rubber						
Patio Blocks/Plastic						
Playground Surfaces						
Concrete with fly ash						
Concrete with slag cement						
Concrete with low cement content						
Plastic lumber						
Building Insulation						
Rock Wool						
Fiber glass						
Cellulose						
Perlite Comp Board						
Plastic Rigid Foam						
Glass Fiber Reinforced Foam						
Phenolic Rigid Foam						
Ceramic tile						
Resilient flooring						
Floor Tiles/Rubber						
Floor Tiles/Plastic						
Running Tracks						
Carpet (PET)						

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Paint						
Reprocessed Latex Paint White & Light Colors						
Reprocessed Latex Dark Colors						
Consolidated Latex Paint						
Toilet/Shower partitions (plastic or steel)						
Other						

CERTIFICATION

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:

1. The product does not meet appropriate performance standards.
2. The product is not available within a reasonable time frame.
3. The product is not available competitively (from two or more sources).
4. The product is only available at an unreasonable price (compared with a comparable non-recycled content product.)

Signature: _____ Date:

END OF
AFFIRMATIVE PROCUREMENT REPORTING FORM
Recycled Content Materials & Biobased Content Materials

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SECTION 017310 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Division 2 Section for hazardous materials remediation.
2. Other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.03 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.04 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.

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3. Fire-suppression systems.
4. Mechanical systems piping and ducts.
5. Control systems.
6. Communication systems.
7. Conveying systems.
8. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

CI. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Contracting Officer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

CII. Power Actuated Fasteners: The use of power actuated fasteners, including pneumatic, gas fuel, powder or electro-mechanical ("flywheel") actuated type fasteners, is specifically prohibited. Use only self-tapping screw-type fasteners or anchors placed in pre-drilled holes.

1.05 SUBMITTALS

A. General: Where patching requires use of new materials that visually match existing conditions, submit samples for review by Contracting Officer. Samples may be "in-place," and may remain if samples are approved.

B. Mortar Submittals for Approval at Historic Masonry

1. Mortar Samples for Selection: Make Samples using same sand and mortar ingredients to be used on Project. Architect's approval of this sample shall direct Contractor to prepare a sample panel and shall not constitute approval of the material. The intent is to match the existing historic mortar.

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2. List of Materials Used in Constructing Sample: List product names together with manufacturers, manufacturers' product names, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
3. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
4. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

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B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.03 BRICK REMOVAL, SALVAGE AND REINSTALLATION

A. At locations indicated, carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

D. Mortar for Brick Masonry in restoration work, or where brick matching historic brick is used: Comply with ASTM C 270, Proportion Specification.

1. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
2. Mixing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1 to 2 hours. Add remaining water in small portions until reaching mortar of the desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

    a. Do not use admixtures of any kind in mortar, unless otherwise indicated.

3. Within the historic brickwork, the predominant mortar is believed to be a weak Portland cement mortar. Restored masonry is intended to match historic masonry. Mix mortar materials in the following proportions:

    a. 1 part Portland cement, 6 parts lime, and 12 parts colored- or natural-mortar aggregate.

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E. Colored Mortar: Select and proportion colored sands to produce color required to match existing. In order to match historic mortar colors, buff or brown sands may be required.

F. Install reused brick into bonding and coursing pattern of existing brick. Tooth in brickwork to continue bonding patterns. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

G. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.

1. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to match adjacent existing masonry.

3.04 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

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5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and matches adjoining construction.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

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SECTION 017340 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general procedural requirements governing execution of Work including:

1. Coordination with utility service providers
2. Construction layout
3. Field engineering and surveying
4. General installation of products
5. Progress cleaning
6. Starting and adjusting
7. Protection of installed construction
8. Correction of the Work

1.2 SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: Existence and location of site improvements and other construction indicated as existing are not guaranteed.

1. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
2. Before construction, verify the location and points of connection of utility services.

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B. Existing Utilities: Existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existence and location of underground utilities and other construction affecting Work.

1. Before construction, verify location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 COORDINATION WITH UTILITY SERVICE PROVIDERS

A. Coordination with Utility Service Providers: Contact following Utility Service providers, sufficiently in advance to avoid delaying the work, to coordinate Contractor's portion of Work, testing requirements, inspections, etc.

1. Electrical: Service Contact: Contact service provider to coordinate Electrical service requirements.
2. Water Service Contact: Contact service provider to coordinate Water service requirements.
3. Wastewater Service Contact: Contact authority to coordinate Wastewater service requirements.
4. Telephone Service Contact: Contact service provider to coordinate Telephone service requirements.

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3.3 PREPARATION

A. Field Measurements: Take field measurements as required to fit Work properly. Recheck measurements before installing each product. Where portions of Work are indicated fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of need for clarification of the Contract Documents caused by differing field conditions outside control of Contractor, submit request for information to Contracting Officer in accordance with Section 013100 "Project Management and Coordination."

3.4 CONSTRUCTION LAYOUT

A. Verification: Verify layout information shown on Drawings, in relation to the existing benchmarks before proceeding to lay out Work. Notify Contracting Officer promptly if discrepancies are discovered.

B. General: Engage a professional engineer to lay out Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check location, level and plumb, of every major element as Work progresses.
5. Notify Contracting Officer when deviations from required lines and levels exceed allowable tolerances.

C. Record Log: Maintain log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make log available for review by National Park Service (NPS).

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3.5 INSTALLATION

A. General: Locate Work and components of Work accurately in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions for best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Contracting Officer.
2. Allow for building movement, thermal expansion, and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors to be embedded in concrete or masonry. Deliver to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials not considered hazardous.

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3.6 PROGRESS CLEANING

A. General: Clean Project site, work areas, and common areas daily. Coordinate progress cleaning for joint-use areas where more than one Installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in National Fire Protection Association (NFPA) 241 for removal of combustible waste materials and debris at the end of every work session.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 degrees Fahrenheit (27 degrees Celsius).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to level of cleanliness necessary for proper execution of Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of Work, broom-clean or vacuum entire work area, as appropriate.
3. Contractor shall provide progress cleaning that minimizes sources of food, water, and harborage available to pests.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials not hazardous to health or property and will not damage exposed surfaces.

1. Utilize non-toxic cleaning materials and methods.

a. Comply with Green Seal Standard (GS) 37 for general purpose cleaning and bathroom cleaning.
b. Use natural cleaning materials where feasible. Natural cleaning materials include:

1) Abrasive cleaners: substitute 1/2 lemon dipped in borax.
2) Ammonia: substitute vinegar, salt and water mixture, or baking soda and water.
3) Disinfectants: substitute 1/2 cup borax in gallon water.
4) Drain cleaners: substitute 1/4 cup baking soda and 1/4 cup vinegar in boiling water.

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5) Upholstery cleaners: substitute dry cornstarch.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. Clean and protect construction in progress and adjoining materials already in place during handling and installation. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations so that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or deleterious exposure during construction period.

K. Final Cleaning: At completion of Work, remove remaining waste materials, rubbish, tools, equipment, machinery and surplus materials. Clean exposed surfaces and leave Project clean and ready for occupancy.

1. Provide final cleaning in accordance with ASTM E1971.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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D. Manufacturer's Field Service: If factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to specified condition.

C. Remove and replace damaged surfaces exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Solid Waste: Garbage, debris, sludge, or other discharged material (except hazardous waste) including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations.

D. Debris: Non-hazardous solid waste generated during construction, demolition, or renovation of a structure which exceeds 2.5 inch (60 millimeter) particle size that is: a manufactured object; plant or animal matter; or natural geologic material (e.g. cobbles and boulders). A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if mixture is comprised primarily of debris by volume, based on visual inspection.

E. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

F. Environmental Pollution and Damage: Presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade utility of environment for aesthetic, cultural, or historical purposes.

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G. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

H. Hazardous Materials: Material regulated as a hazardous material in accordance with 49 CFR 173 (Code of Federal Regulations), requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have potential to meet the definition of Hazardous Waste in accordance with 40 CFR 261.

I. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

J. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

K. Single-use plastic products: Plastic items intended to be disposed of immediately after use, including plastic and polystyrene food and beverage containers, bottles, straws, cups, cutlery, and disposable plastic bags.

1.3 PERFORMANCE REQUIREMENTS

A. General: Project shall minimize creation of construction, deconstruction, and demolition waste to protect and restore natural habitat and resources. Minimize factors contributing to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, single-use plastic products, and contamination. A Waste Management Plan shall be developed to ensure that existing site and building materials are reused, salvaged, or recycled. Minimize waste disposal in landfills.

B. Salvage /Recycle Requirements: Develop waste management plan resulting in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work. The following waste categories, at a minimum, shall be diverted from a landfill:

1. Clean dimensional wood, palettes
2. Plywood, OSB (oriented strand board), and particle board
3. Cardboard, paper, packaging, newsprint
4. Metals (from banding, stud trim, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze)
5. Gypsum drywall - unpainted
6. Non-hazardous paint and paint cans
7. Beverage containers: Aluminum, glass, and plastic containers
8. Ductwork

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9. Wiring
10. Other mixed construction and demolition waste as appropriate.

C. If waste materials encountered during deconstruction/demolition or construction phase are found to contain lead, asbestos, polychlorinated biphenyls (PCBs), (such as fluorescent lamp ballasts), or other harmful substances, they are to be handled and removed in accordance with local, state, and federal laws and requirements concerning hazardous waste.

D. Existing items and material to be removed during deconstruction/demolition phase shall be reused in construction phase of the Project. Items that cannot be reused shall be recycled. Items considered for reuse must be in refurbishable condition and must meet quality standards set forth in these specifications. Contractor shall ensure quality of the item(s) in question will meet or exceed accepted industry or trade standards for first quality commercial grade application. During construction, deconstruction, or demolition Contracting Officer (CO) may designate other objects or materials for reuse.

1.4 SUBMITTALS

A. Waste Management Plan: After award of contract and prior to scheduled Pre-Construction Conference, Contractor shall submit a draft Waste Management Plan to Contracting Officer for approval. Submit 3 copies of plan. Revise and resubmit Plan as required by Contracting Officer. Approval of Contractor's Plan will not relieve Contractor of responsibility for compliance with applicable environmental regulations.

B. Progress Documentation: Supplemental to Waste Management Plan, document solid waste disposal, diversion, and cost/revenue analysis and submit completed worksheet on a monthly basis. See Project Waste Management Plan Worksheet Sample, attached to the end of the Division 1 Specifications, and report totals to date for column headings.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

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F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For Waste Management Coordinator andrefrigerant recovery technician.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating refrigerant that was present was recovered and recovery was performed according to Environmental Protection Agency (EPA) regulations. Include name and address of technician and date refrigerant was recovered.

I. Progress payment requirements:

1. With each Application for payment, submit an updated Project Waste Management Plan worksheet for solid waste disposal and diversion.

2. With each Application for Payment, submit manifests, weight tickets, receipts, and invoices specifically identifying the Project and waste material.

J. Closeout Submittals

1. With Closeout Submittals, submit a summary of a Project Waste Management Plan worksheet for solid waste disposal and diversion.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with record of successful waste management coordination of projects with similar requirements, that employs a LEED™-Accredited Professional, certified by USGBC, as waste management coordinator.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Meeting: Conduct separate meeting or cover in Pre-Construction Conference and comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.

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3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review procedures for reduction of single-use plastic products on site.
6. Review waste management requirements for each trade.

PART 2 - PRODUCTS

2.1 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction work plan.

B. Waste Identification: Indicate anticipated types of demolition, and construction waste generated by the Work.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials salvaged and reused in Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials sold to individuals and organizations, include list of names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials donated to individuals and organizations, include list of names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
7. Reduction of single-use plastic products: Include methods for water distribution to include bottle refilling stations if available for personnel.

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PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Contracting Officer. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during entire duration of Contract.

B. Contractor shall establish contacts with local recycling and reuse companies to set up lines of responsibility. Contractor shall be responsible for coordination in terms of identifying materials, pickup schedules, and standard quality for recycled materials.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

E. Separation facilities:

1. Contractor shall designate and Contracting Officer shall approve specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.
2. Place waste and recycling bins near each other, and close to point of waste generation but out of traffic pattern.
3. Keep recycling and waste bin areas neat, clean, and clearly marked in order to avoid co-mingling of materials.
4. Protect bins during non-working hours from off-site contamination.
5. Check garbage dumpsters periodically for recyclables being thrown away and undocumented materials that could be recycled.

F. Materials handling procedures: Material to be recycled shall be protected from contamination and shall be handled, stored, and transported in a manner that meets requirements set by designated facilities for acceptance. Establish defined area for operations of each trade, especially woodcutting so off-cuts are kept in one area and can be sorted by dimension for future reuse.

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3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off ground and protect from weather.
5. Remove recyclable waste off Government property and transport to recycling receiver or processor.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

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E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

G. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

H. Plumbing Fixtures: Separate by type and size.

I. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

J. Lighting Fixtures: Separate lamps by type and protect from breakage.

K. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

L. Conduit: Reduce conduit to straight lengths and store by type and size.

M. Electronic Products: Ensure non-usable electronic products are reused, donated, sold, or recycled using environmentally sound management practices at end of life.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees [**on-site**] [**at landfill facility**].

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C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust not containing painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose in landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials to accumulate on-site.
2. Remove and transport debris in manner preventing spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials allowed only at designated areas on Government property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport waste materials off Government property and legally dispose of them.

END OF SECTION

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including:

1. Project Record Drawings
2. Closeout Submittals
3. Substantial Completion and Final Inspection
4. Permit Closure and Transfer
5. Final Acceptance of the Work
6. Warranties

1.2 PROJECT RECORD DRAWINGS

A. Maintain one complete full-size set of contract drawings and one full-size set of vendor-supplied drawings. Clearly mark changes, deletions, and additions using National Park Service (NPS) drafting standards to show actual construction conditions. Show additions in red, deletions in green and special instructions in blue.

B. Keep record drawings current. Make record drawings available to Contracting Officer (CO) for inspection at the time of monthly progress payment requests. If project record drawings are not current, Contracting Officer may retain an appropriate amount of progress payment.

C. Submit complete record drawings on completion of total project. Include shop drawings, sketches, and additional drawings to be included in final set, with clear instructions showing the location of these drawings.

1.3 CLOSEOUT SUBMITTALS

A. A list of closeout requirements has been attached at the end of the Division 1 Specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. Terms and conditions of the contract require satisfaction of requirements of individual specification sections regardless of what is shown on the list. Submit the following before requesting final inspection:

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1. Specific warranties, guarantees, workmanship bonds, final certifications, and similar documents.
2. NPS required forms for occupancy, Fire Sprinkler/Alarm acceptance, and other similar forms or certificates.
3. Project Record Documents, operation and maintenance manuals, final completion construction digital images recorded on CD-R (compact disc-recordable) or DVD-R (digital video disc-recordable) with index and descriptions, and similar final record information.
4. Environmental Record Documents: As specified in individual specification sections and as follows:

    a. IAQ Management Plan: As specified in Section 015719.11 ‘Indoor Air Quality (IAQ) Management.”
    b. Product Data for filtration media: As specified in 015719.11 “Section Indoor Air Quality (IAQ) Management.”
    c. Moisture Control inspections and reports: As specified in Section 015719.11 “Section Indoor Air Quality (IAQ) Management.”
    d. Material Safety Data Sheet (MSDS) Data: As specified in Section 015719.11 “Section Indoor Air Quality (IAQ) Management” and Section 016700 “Product Requirements.”
    e. Final Summary of Solid Waste Disposal and Diversion: As specified in Section 017419 “Construction Waste Management.”
    f. Commissioning Report: As specified in Mechanical Sections.

5. Posted Operating Instructions: As specified in individual sections. Furnish operating instructions attached to or posted adjacent to equipment. Include wiring diagrams, control diagrams, control sequence, start-up, adjustment, operation, lubrication, shut-down, safety precautions, procedures in the event of equipment failure, and other items of instruction recommended by manufacturer.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Contracting Officer. Label with manufacturer's name and model number where applicable.

    a. Special Tools: One set of special tools required to operate, adjust, dismantle, or repair equipment. Special tools are those not normally found in possession of mechanics or maintenance personnel.

7. Keys and Keying Schedule: Submit keys including duplicates. Wire keys for each lock securely together. Tag and plainly mark with lock number, equipment identification, or panel or switch number, and indicate location, building, and room name or number.
8. Make final changeover of permanent locks and deliver keys to Contracting Officer. Advise Park personnel of changeover in security provisions.

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9. Approved pre-functional checklists and functional performance testing reports from commissioning documentation.

    a. Equipment start-up requires coordination with commissioning process.

10. Test and balance report.
11. Terminate and remove temporary facilities, mockups, construction tools, and similar elements from Project site, complete final cleaning requirements, including touchup painting.
12. Touch up and repair and restore marred exposed finishes to eliminate visual defects.
13. Instruct NPS personnel in operation, adjustment, and maintenance of products, equipment, and systems.

1.4 FINAL INSPECTION, SUBSTANTIAL COMPLETION AND ACCEPTANCE PROCEDURES

A. Request final inspection in writing when project or designated portion of project is substantially complete. Contracting Officer will proceed with inspection within 10 days of receipt of written request or will advise Contractor of items that prevent project from being substantially complete.

B. If work is determined substantially complete, following final inspection, Contracting Officer will prepare Punch List and issue a Letter of Substantial Completion.

C. If work is not determined substantially complete following final inspection, Contracting Officer will notify Contractor in writing. Contractor shall request new final inspection after completing work. Re-inspection costs may be charged against Contractor in accordance with Inspection of Construction contract clause.

D. Contractor shall complete Punch List within 30 calendar days, documented weather permitting.

    1. Prior to requesting final inspection:

        a. Complete commissioning requirements unless approved in writing by Contracting Officer.

E. If Contractor completes items of work on Punch List and contractually required items, Contracting Officer will issue Letter of final acceptance of work.

F. If Contractor fails to complete work within the time frame, Contracting Officer may correct work with an appropriate reduction in contract price or charge for re-inspection costs in accordance with Inspection of Construction contract clause.

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1.5 PERMIT CLOSURE AND TRANSFER

A. When work covered by the permits is complete, create list of tasks required to close or transfer permits to Park. Submit to Contracting Officer for approval.

B. After substantial completion and Punch List completion, permits shall be closed and documented by Agency(ies) with Jurisdiction for the permit.

C. If responsibility for permits is to be transferred to Park, Park shall be informed of permit provisions completed and responsibilities transferring to Park staff.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Contracting Officer for designated portions of Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on table of contents of Project Manual.

1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF (portable document format) file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. See Division 1 Specification Section "Execution" for information on cleaning agents.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Conduct final cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

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B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of stains, films, and foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo, soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and vision-obscuring materials. Replace chipped or broken glass and transparent materials. Polish mirrors and glass.
k. Remove labels that are not permanent.
l. Touch up, repair, and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" (Underwriters Laboratories) and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to sanitary condition, free of stains, including stains resulting from water exposure.

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p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out and noticeably dimmed bulbs, and defective or noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage experienced, licensed exterminator to make a final inspection and rid project of rodents, insects, and other pests. Provide Government with report.

D. Waste Disposal: Comply with requirements of Section 017419 "Construction Waste Management and Disposal."

END OF SECTION

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including:

1. Manuals, general
2. Emergency manuals
3. Operation manuals for systems, subsystems, and equipment
4. Maintenance manuals for care and maintenance of products, materials, and finishes systems and equipment

B. See Divisions 2 through 49 Sections for additional operation and maintenance manual requirements for Work in those Sections.

1.2 SUBMITTALS

A. Manual: Submit two copies of each manual in draft form or one electronic copy at least 15 days before final inspection. Contracting Officer (CO) will return copy or edit version with comments within 15 days of receipt.

B. Format: Submit operations and maintenance manuals in following format:

1. PDF (portable document format) electronic file. Assemble each manual into composite electronically indexed file. Submit on digital media acceptable to Contracting Officer.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Hard copy manual: In accordance with Part 2 of this Section.
3. Correct or modify each manual to comply with Contracting Officers comments. Submit 4 copies of each corrected manual within 15days of receipt of Contracting Officers comments.

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PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize manual into separate sections for each system and subsystem, and separate sections for each piece of equipment not part of a system. Manual shall contain title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include:

1. Project Title
2. Location
3. Park
4. Contract Number
5. Prime Contractors Name and Address
6. Date of Substantial Completion
7. Binder Volume Number

C. Table of Contents: List each product included in manual, identified by product name, indexed to content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. Assemble instructions for subsystems, equipment, and components of one system into a single binder if needed.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

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2.2 EMERGENCY MANUALS

A. Content: Organize manual into separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, gas leak, water leak, power failure, water outage, equipment failure, and chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of National Park Service (NPS) operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION AND MAINTENANCE MANUALS

A. Operation Requirements

1. Content: In addition to requirements in Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
2. Descriptions: Include:

    a. Product name and model number
    b. Manufacturer's name
    c. Equipment identification with serial number of each component
    d. Equipment function
    e. Operating characteristics
    f. Limiting conditions
    g. Performance curves
    h. Engineering data and tests
    i. Complete nomenclature and number of replacement parts

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3. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
4. Systems and Equipment Controls: Describe sequence of operation, and diagram controls as installed.
5. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

B. Maintenance Requirements for Systems and Equipment

1. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, and equipment data sheets as described below.
2. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
3. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:
4. Maintenance Procedures: Test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, detailing essential maintenance and environmental procedures.
5. Maintenance and Service Schedules: Service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
6. Spare Parts List and Source Information: Lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
7. Warranties and Bonds: Copies of warranties and bonds and lists of circumstances and conditions that affect validity of warranties or bonds.

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2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include:

1. Product name and model number
2. Manufacturer's name
3. Color, pattern, and texture
4. Material and chemical composition
5. Reordering information for specially manufactured products

D. Environmental Requirements

1. Identify environmentally preferable products incorporated into Project. Include: product model; manufacturer’s name, address, phone, and website; and local technical representative.

a. Verify plastic products to be incorporated into Project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance Manual.

1) Type 1: Polyethylene Terephthalate (PET, PETE)
2) Type 2: High Density Polyethylene (HDPE)
3) Type 3: Vinyl (Polyvinyl Chloride or PVC)
4) Type 4: Low Density Polyethylene (LDPE)
5) Type 5: Polypropylene (PP)
6) Type 6: Polystyrene (PS)
7) Type 7: Other. Use of this code indicates that package in question is made with a resin other than the six listed above or is made of more than one resin listed above and used in a multi-layer combination.

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b. Describe maintenance procedures associated with environmentally preferable materials and systems. Provide cleaning recommendations in accordance with ASTM E1971 and approved Integrated Pest Management (IPM) plan.

1) Include potential environmental impacts of recommended maintenance procedures and materials.
2) Include potential indoor air quality impacts of recommended maintenance procedures and materials.
3) Where proposed maintenance procedures incorporate composting of plastics, assess potential effect of each type of plastic to be included in composting process in accordance with ASTM D5509 or ASTM D6002

c. Material Safety Data Sheets (MSDS): Include MSDSs as specified.

2. Develop environmental management programs for facility as follows:

a. Waste management program: Develop in accordance with ASTM E1609. Maximize use of source reduction and recycling procedures outlined in ASTM D5834.
b. Indoor Air Quality (IAQ) management program: Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with ASTM D6245. Provide for evaluation of VOCs (volatile organic compounds) in indoor air in accordance with ASTM D6345.
c. Water management program: Develop water monitoring program for surface and ground water on project site in accordance with ASTM D5851 and consistent with water management program utilized during construction operations.

E. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures,

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maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following and items detailing essential maintenance procedures:

1. Test and inspection instructions
2. Troubleshooting guide
3. Precautions against improper maintenance
4. Disassembly; component removal, repair, and replacement; and reassembly instructions
5. Aligning, adjusting, and checking instructions
6. Demonstration and training video recording

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

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G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that affect validity of warranties or bonds.

1. Include procedures and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 GENERAL

A. At start of project, begin accumulating operation and maintenance data and initiate index. Install and index data in binders within 30 days after delivery of items. As custom written data and test results are produced, add to operation and maintenance data file.

B. List of Operation and Maintenance requirements has been attached at end of the Division 1 Specifications for your convenience. Intent is to provide an overall summary of requirements and not a comprehensive list. Terms and conditions of the contract require satisfaction of requirements of individual specification sections regardless of what is shown on the list.

C. Keep operation and maintenance data current. Make operation and maintenance binders available to Contracting Officer for inspection at time of monthly progress payment requests. If operation and maintenance binders are not current, Contracting Officer may retain an appropriate amount of the progress payment.

3.2 MANUAL PREPARATION

A. Manual Types

1. Emergency Manual: Assemble complete set of emergency information indicating procedures for use by emergency personnel and by NPS operating personnel for types of emergencies indicated.
2. Product Maintenance Manual: Assemble complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into Work.
3. Operation and Maintenance Manuals: Assemble complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

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B. Manual Contents: Including:

1. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark sheet to identify product or component incorporated into Work. If data include more than one item in a tabular format, identify each item using appropriate references from Contract Documents. Identify data applicable to Work and delete references to information not applicable.
2. Custom Written Data: For data not in manufacturer's standard literature, provide text, drawings, and schematics specifically applicable to installed systems. Include step-by-step descriptions of operating procedures; identification of individual components and their functions; descriptions of how system components relate to one another and operate together to accomplish a common process or function; and sequence of operation for system control circuits. For seasonally operated systems, provide start-up and shutdown instructions.
3. Equipment Data Sheets: For each item of equipment included in operation and maintenance data, provide Equipment Data Sheet using form at the end of this section. For equipment consisting of a driven machine and a driver (for example, a pump and a motor), equipment data shall cover both the driven machine and the driver. For similar type equipment (for example, multiple exhaust fans of the same model and type), provide a single equipment data sheet with an attached schedule listing individual equipment items.
4. Vendor Furnished As-Built Drawings: Provide for each electrical and each mechanical control system.

    a. For each control system, provide control circuit schematic drawings. Identify each wire and terminal block number. Show terminal numbers on control devices. Show control wires and devices remote from control panel.
    b. For each control panel, provide general arrangement drawing showing location of each control component and terminal block on the panel front and interior. Include materials list of panel-mounted control components as well as field-installed control components remote from the panel, identifying components, manufacturer, model number, and initial set points or sensing ranges of devices where applicable.
    c. For packaged equipment systems, provide general arrangement drawings showing interrelationships of the various items of equipment and components.
    d. In addition to control wiring schematic, provide power wiring schematic drawing showing power flow to each motor. Identify each power conductor. Show over-current protection and motor starting devices.

C. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

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BUILDING 1, CHARLESTOWN NAVY YARD
BOSTON NATIONAL HISTORICAL PARK
PMIS # 154176C
SCHWARTZ/SILVER ARCHITECTS

END OF SECTION

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EQUIPMENT DATA SHEET

Equipment Item: _____ Designation: _____

Function: _____

Location: _____

Project: _____

Model Number: _____ Serial Number: _____

Manufacturer Address and Phone:	Supplier Address and Phone:

Preventive Maintenance Tasks:

Nameplate Data:

Spare Parts Furnished and Other Information:

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing National Park Service (NPS) personnel, including:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment, including environmental considerations.
3. Demonstration and training video.

B. See Divisions 2 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 GENERAL REQUIRMENTS

A. List of System Demonstration and Training requirements has been attached at end of Division 1 Specifications for your convenience. Intent is to provide overall summary of requirements and not a comprehensive list. Terms and conditions of contract still require satisfaction of requirements of individual specification sections regardless of what is shown on list.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. For each training session, Contractor shall submit for approval a proposed outline of subjects to be covered. Training shall not be conducted until outline is approved.

B. Demonstration and Training Video: Submit two copies of each DVD (digital video disc) for training sessions within seven days of end of each training module.

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1. Label each DVD with date of demonstration or training, instructor's name, and provide an index of contents. Index shall list start and end time of each subject covered during training session. Sequence of training subjects shall follow sequence listed in approved training outline or as actually conducted

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: Firm or individual experienced in training or educating maintenance personnel in training program similar in content and extent for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: Factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Contracting Officer (CO).

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and:

1. Environmental Topics

a. Overview of environmental issues related to building industry.
b. Overview of environmental issues related to Project.
c. Review of site-specific procedures and management plans implemented during construction:

1) Regulatory Requirements
2) Indoor Air Quality (IAQ) Management
3) Noise and Acoustics Management
4) Environmental Management
5) Construction Waste Management

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d. Review of site-specific procedures and management plans to be implemented during operation and maintenance.

1) Include review of environmentally related aspects of Operations and Maintenance Manual.
2) Integrated Pest Management (IPM)

B. Training Modules: Develop a learning objective and teaching outline for each module. Include description of specific skills and knowledge that participant is expected to master. For each module, include instruction for:

1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Alignments and checking, noise, vibration, economy, and efficiency adjustments.
6. Troubleshooting: Diagnostic instructions and test and inspection procedures.
7. Maintenance: Inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

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PART 3 - EXECUTION

3.1 INSTRUCTION

A. Facilitator: Engage qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Contracting Officer for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct NPS personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with NPS through Contracting Officer with at least seven days' advance notice.
2. Conduct training sessions after equipment or system has been accepted and turned over to Government. Coordinate with commissioning requirements.
3. Coordinate with Integrated pest management requirements. Refer to specifications section and approved IPM plan.
4. Individual sections specify duration of training required. If no duration is listed, provide training of sufficient duration to adequately cover subjects.

3.2 DEMONSTRATION AND TRAINING VIDEO

A. General: Engage qualified commercial photographer to record demonstration and training video. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of training module, record each chart containing learning objective and lesson outline.

B. Video Format: Digital Video Disc (DVD).

C. Video Recording: Record sessions with high resolution equipment. Instructor's voice shall be clearly audible and understandable on DVD. Utilize supplemental microphone worn by instructor.

D. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

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1. DVDs with poor video or audio quality will be rejected and training recorded again.

END OF SECTION

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SECTION 018113 - SUSTAINABLE DESIGN REQUIREMENTS FOR NON-LEED™ PROJECTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with Federal Sustainability requirements. This project is not seeking Leadership in Energy & Environmental Design (LEED™) certification but shall comply with applicable Federal Sustainability requirements. Requirements include laws (Executive Orders (EO) and regulations), management policies, building codes and standards, Federal directives, and National Park Service (NPS) guidelines.

B. Many Federal requirements can be achieved only through intelligent and integrated design of the project and are beyond control of the Contractor. Certain requirements relate to the products and procedures used for construction, therefore, full cooperation of the Contractor and Subcontractors is essential to successful compliance with Federal requirements.

C. Contractors shall familiarize themselves with relevant requirements and provide necessary information and instruction to subcontractors and installers.

1. Some requirements involve quantifying percentages by weight; these require careful recordkeeping and reporting by Contractor.
2. See Denver Service Center (DSC) Workflows Sustainability Standards for a list of Federal Sustainability requirements. Applicable Federal Sustainability requirements are also summarized on the project's NPS Project Sustainability Checklist. Contractor is responsible for ensuring the elements in the NPS Project Sustainability Checklist, identified by the Contracting Officer, are incorporated into the construction of the project.

D. Related Sections:

1. See Divisions 1 through 49 Sections for sustainability requirements specific to work of each of these Sections.

1.2 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying wood used to make products was obtained from forests certified by a Forest Stewardship Council (FSC)-accredited certification body to comply with FSC Standard STD-01-001, "FSC Principles and Criteria for

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Forest Stewardship." Certificates shall include evidence manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. LEED™: Leadership in Energy & Environmental Design. Sustainability rating system developed by United States Green Building Council (USGBC).

C. Rapidly Renewable Materials: Materials made from plants typically harvested within 10-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

D. Recycled Content: Recycled content value of a material assembly shall be determined by weight.

1. "Post-consumer" material: Waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of product, which can no longer be used for intended purpose.
2. "Pre-consumer" material: Material diverted from waste stream during manufacturing process. Reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it is excluded.

E. Biopreferred Products: Commercial or industrial products (other than food or feed) composed in whole, or in significant part, of biological products, renewable agricultural materials (including plant, animal, and marine materials), or forestry materials and includes biobased intermediate ingredients or feedstocks.

1.3 FEDERAL SUSTAINABILITY DOCUMENTATION SUBMITTALS

A. Most of Federal sustainability documentation submittals are aggregations of submittals already required in relevant technical specifications. They are mentioned here to ensure they are collected and organized together to efficiently document compliance with sustainability requirements.

B. Provide preliminary submittals to NPS indicating how the following Federal requirements will be met:

1. Recycled Content: List of specified/proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
2. Certified Wood: Product data and/or chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.

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3. Construction Indoor Air Quality (IAQ) Management Plan – During Construction:

    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during construction period, along with brief description of the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) approach employed, documenting implementation of indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

4. Construction IAQ Management Plan – Before Occupancy:

    a. Signed statement describing building air flush-out procedures including dates when flush-out was started and completed and statement filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.

5. Low Emitting Materials - Adhesives and Sealants: Product data for adhesives and sealants used inside weatherproofing system indicating Volatile Organic Compound (VOC) content of each product used. Indicate VOC content in g/L (grams per liter) calculated according to 40 CFR 59 Subpart D (Code of Federal Regulations).
6. Low Emitting Materials - Paints and Coatings: Product data for paints and coatings used inside weatherproofing system indicating [**chemical composition and**] VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59 Subpart D.
7. Low Emitting Materials - Flooring: Product data for products containing composite wood or agrifiber products or wood glues indicating they do not contain urea-formaldehyde resin.
8. Biopreferred Products: Provide list of bio-based products used on project.

PART 2 - PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

A. Recycled Content: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 10 percent of cost of materials used for Project.

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1. Determine cost of post-consumer recycled content by dividing weight of post-consumer recycled content in item by total weight of item and multiplying by cost of item.
2. Determine cost of pre-consumer recycled content of an item by dividing weight of pre-consumer recycled content in item by total weight of item and multiplying by cost of item.
3. Do not include furniture, mechanical and electrical components, and specialty items such as elevators and equipment in calculation.

2.2 BIOPREFERRED PRODUCTS

A. Use bio-based products found on United States Department of Agriculture (USDA) Biopreferred Products list where applicable on project.

2.3 LOW-EMITTING MATERIALS

A. For applications inside the weatherproofing system, use adhesives and sealants that comply with VOC content limits in Specification Divisions 2 through 49.

B. For field applications inside the weatherproofing system, use paints and coatings that comply with VOC content limits in Specification Divisions 2 through 49.

C. Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 REFRIGERANT REMOVAL

A. Remove Chlorofluorocarbons (CFC)-based refrigerants from existing Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC&R) equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant as described in Division 23 Sections.

3.2 MEASUREMENT AND VERIFICATION

A. Coordinate with Divisions 2 through 49 for project requirements regarding installation of building level metering equipment to measure energy, water, and electric usage.

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3.3 INDOOR-AIR-QUALITY MANAGEMENT

A. Coordinate with Section 01 57 19.11 "Indoor Air Quality Management" for managing indoor air quality during construction and prior to occupancy.

END OF SECTION

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Removal for reuse of existing items or materials for work indicated in other sections, as follows:

    a. Exterior face brick.

B. Related Sections include the following:

1. Section 011000 - "Summary of Work" for use of premises, and phasing, and Owner-requirements.
2. Section 017310 - "Cutting and Patching" for cutting and patching procedures.
3. Section 040322 – “Brick Masonry Repair and Reconstruction" for removal of brick units from existing construction.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items or materials from existing construction and deliver them to the Government, at a location as directed.

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C. Remove and Reinstall: Detach items or materials from existing construction and prepare for use in the work, at original locations or new locations as indicated. The contract documents refer to these items or materials also as "salvaged" when shown at installed locations in the work.
D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Government that may be encountered during selective demolition remain Government's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Government.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Government as far as practical.

1. Before selective demolition, Government will remove the following items:

a. Loose furnishings.
b. Wall-hung framed paintings and photographs.

B. Notify Contracting Officer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

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C. Hazardous Materials: Hazardous materials abatement work may be present. If such materials are found, notify Government.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Contracting Officer.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

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1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 1.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

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3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Government.
4. Transport items to Government's storage area designated by Government.
5. Protect items from damage during transport and storage.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Contracting Officer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR MATERIALS TO RE-USED IN THE WORK

A. Exterior face brick: Remove whole units; remove mortar from all faces of each unit. See Section 040322 – “Brick Masonry Repair and Reconstruction" for removal of brick units from existing construction.

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3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Government's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Government's property and legally dispose of them.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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SECTION 028200--ASBESTOS REMEDIATION

PART 1—GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS that are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT AND GENERAL CONDITIONS.

C. Within this section, the entities listed shall be designated as follows.

1. The Boston National Historical Park shall be referred to as the GOVERNMENT

2. The Schwartz/Silver Architects shall be referred to as the CONTRACTING OFFICER

3. The designated industrial hygienist/consultant, Environmental Health & Engineering, Inc. (EH&E), shall be referred to as the CONSULTANT

4. The Asbestos Remediation Sub-Contractor to be selected for the removal and/or remediation of asbestos-containing materials (ACMs) shall be referred to as the REMEDIATION CONTRACTOR

1.2 DESCRIPTION OF WORK

A. This plan includes specifications for the removal of asbestos materials located at Building 1, The Chauffeur’s Quarters and Garage (the Spaces) at the Boston National Historical Park, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts. The REMEDIATION CONTRACTOR shall furnish all labor, material, supervision, construction tools, transport vehicles and equipment necessary to perform the following work:

1. Pre-bid inspection. The potential Bidders are encouraged to visit the Spaces prior to bidding in order to determine the actual amounts of materials and contaminated materials to be removed. The bidders must review all elements of this specification prior to submitting their final bid.

2. This document serves as the basis of information pertaining to the locations and amounts of materials to be remediated at the Site. If any discrepancies exist between

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the site specifications and the site conditions, the REMEDIATION CONTRACTOR must notify the GOVERNMENT and the CONSULTANT prior to signing the contract. Additional compensation to correct a difficulty or difference form conditions implied or indicated in this document that would have been apparent during the site visit will not be approved.

3. The REMEDIATION CONTRACTOR shall be required to submit a Site-Specific Work Plan conforming to the requirements in this specification for removing or clearing the materials in the locations outlined in this section or depicted in Figure B.1 in Attachment B.

4. The removal of asbestos materials will include the following (see Appendix B, Figure B.1):

    a. All Thermal Systems Insulation (TSI), including fittings, elbows, saddles, and wall sleeves on the horizontal steam pipes in the northwest interior perimeter of the Spaces, approximately 50 linear feet and 10 fittings. Abatement to take place either under full negative pressure enclosure or with glove bags as the sole means of enclosure. Iron pipes are to be left in place for demolition by others.

    b. ACM cement board ceilings, on the garage bays' ceilings, approximately 300 square feet. Abatement to take place under full negative pressure enclosure.

    c. ACM frame caulk, residual application on the brick to wood trim of the garage bay door frames, approximately 100 linear feet. Abatement to take place under full negative pressure enclosure concurrent with the garage bay ceiling.

    d. ACM window glazing compounds on metal to glass interface of garage bay skylights, and moveable sashes of windows to the chauffeurs' quarters, approximately 150 square feet. Abatement to take place either under full negative pressure enclosure (skylights concurrent with the garage bay ceiling) or in a regulated area consistent with Massachusetts

5. Alternate work plans deviating from this specification must be approved by the CONSULTANT prior to starting the work.

6. Documentation of worker training, respiratory protection and medical examination.

7. Provide access, support and protection to all authorized visitors and inspectors.

8. Filing of and/or obtaining all required notifications, permits, work plans and payment of all required associated costs and fees, including any applicable royalty or patent payments for use of any technology on the project.

9. Work area preparation and work practices.

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10. Proper removal, packaging, transport and disposal of all ACM as specified herein. Note that vehicles transporting bulk-loaded demolition debris containing a reportable quantity (greater than 1 pound) of asbestos shall be properly placarded in accordance with U.S. Department of Transportation (DOT) regulations. All drivers shall be appropriately trained and licensed to transport this material.

11. Isolation of the Work Area for the duration of the work so as to prevent asbestos-contaminated dust or debris from passing beyond the isolated area.

B. In addition to the specific methods in this document, it is the REMEDIATION CONTRACTOR's responsibility to determine the most efficient method to legally perform this Work.

C. The REMEDIATION CONTRACTOR shall perform all work in accordance with these specifications: the U.S. Environmental Protection Agency (EPA) and the U.S. Occupational Safety and Health Administration (OSHA) regulations, National Institute for Occupational Safety and Health (NIOSH) recommendations, Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Labor Standards (MADLS) regulations, local statutes, local ordinances, local codes and any other applicable federal, state and local government regulations and guidelines.

D. The contractor is responsible for worker and site safety, including storing and securing all equipment, materials and waste.

E. Related Sections

1. Section 01 11 00 (Summary of Work)
2. Section 01 22 00 (Unit Prices)
3. Section 01 33 00 (Submittal Requirements)
4. Section 01 42 00 (References)
5. Section 01 50 00 (Temporary Facilities and Controls)
7. Section 01 77 00 (Contract Closeout)
8. Section 02 41 19 (Selective Demolition)

1.3 PERMITS

A. The REMEDIATION CONTRACTOR shall be responsible for obtaining all permits, or submittal of all notifications necessary to execute work conducted for the project at Building 1 at the Charlestown Navy Yard, Boston National Historical Park. The cost for securing all necessary permits shall be included in the REMEDIATION CONTRACTOR's bid. The REMEDIATION CONTRACTOR shall be responsible for adhering to all applicable federal, state, and local rules and regulations including but not limited to, except where more stringent requirements are specified:

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- EPA
- OSHA
- MassDEP
- MADLS
- The Boston Fire Department
- The City of Boston

1.4 SCHEDULING

A. The REMEDIATION CONTRACTOR, CONTRACTING OFFICER, and the GOVERNMENT shall develop an abatement schedule for each phase of work prior to commencement. The GOVERNMENT may choose to alter the work sequence as they see fit.

B. The CONTRACTOR shall update the schedule and submit any schedule changes for review by the CONTRACTING OFFICER and the GOVERNMENT at the weekly construction meetings.

1.5 AUTHORITY TO STOP WORK

A. The GOVERNMENT has the authority to stop the work at any time if it is determined either personally or through the services of the CONSULTANT that conditions are not within the specifications and applicable regulations. The stoppage of work shall continue until conditions have been corrected and corrective steps have been taken to the satisfaction of the GOVERNMENT and CONSULTANT. Standby time required to resolve violations shall be at REMEDIATION CONTRACTOR's expense, and any fines, etc., for hazardous conditions or non-compliance will be at the REMEDIATION CONTRACTOR's expense and will not be grounds for change orders or time extension.

B. Stop work orders may be issued for but not limited to the following:

1. Not conducting the work in compliance with this and related specifications

2. Breaks in barriers

3. Inadequate work area control or isolation

4. Leakage to other areas

5. Fiber concentrations outside the work area that exceed 0.010 fibers per cubic centimeter (f/cc) (0.010 f/cc above established background levels) for any one phase contrast microscopy (PCM) sample

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6. If the REMEDIATION CONTRACTOR disregards laws or regulations of any regulatory or governing body having jurisdiction

7. If the REMEDIATION CONTRACTOR's work presents a risk to the building, to building occupants, to the general public or to the environment as determined by the GOVERNMENT or the CONSULTANT

C. The absence of a stop work order by the GOVERNMENT or the CONSULTANT shall not in any way be construed as an approval or acceptance of the REMEDIATION CONTRACTOR's work.

1.6 CONTRACTOR QUALIFICATIONS

A. The GOVERNMENT shall approve the proposed REMEDIATION CONTRACTOR and will be based upon submission by the REMEDIATION CONTRACTOR of the following:

1. Insurance and bonding as stated in the Contract Documents

2. Licensing by the MADLS as an Asbestos Abatement Contractor

3. Names and locations of at least three asbestos abatement projects similar in scope and size to this project completed by the proposed REMEDIATION CONTRACTOR. Provide the name and phone number of a contact person for each referenced asbestos abatement project.

4. History of violations and fines issued to the abatement contractor by any regulatory or governing agency

1.7 PERSONNEL QUALIFICATIONS

A. All personnel of the REMEDIATION CONTRACTOR or any approved SUB-CONTRACTOR involved with this work shall meet the following minimum qualifications:

1. Asbestos worker medical examination within the past year in accordance with OSHA 1926.1101 with a physician's written opinion that the worker has no condition that would preclude him/her from working with asbestos or wearing a respirator.

2. Current certification by the MADLS as an Asbestos Supervisor or Asbestos Worker that falls into the time frame of their training certificate or refresher training certificate.

3. There shall be a sufficient number of trained and qualified workers, foremen and superintendents to accomplish the work within the required schedule. No untrained or fully qualified and pre-approved person shall be employed to speed up completion of the abatement work.

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1.8 BUILDING INSPECTION

A. The REMEDIATION CONTRACTOR must inspect the site and ascertain the locations and amounts of asbestos materials to be removed. If discrepancies exist between these specifications and/or site conditions, the contractor must notify the GOVERNMENT's project manager prior to signing the contract. Additional compensation to correct a difficulty or difference from conditions implied or indicated in this specification that would have been apparent during the site visit will not be approved.

1.9 DISPOSAL

A. Disposal of all asbestos material shall be in strict accordance with applicable state and federal regulations and sent to licensed facilities that receive and retain asbestos waste. All asbestos materials removed from this site will be kept separate from other waste streams the contractor may handle. Copies of all bill of lading, waste shipment records, and any other documentation must be submitted as proof of proper disposal of asbestos waste.

1.10 DEFINITIONS

A. All terms not defined herein shall have the meaning given in the applicable publications and regulations.

1. Abatement—Procedures to control fiber release from asbestos materials including encapsulation, enclosure and removal.

2. Air Monitoring—The process of measuring the fiber content of a specific volume of air in a stated period of time.

3. Asbestos—The name given to a number of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible and are separated into fibers. Asbestos includes chrysotile, crocidolite, amosite, anthophyllite and actinolite.

4. Asbestos-containing material (ACM)—Any material containing more than 1 percent by weight of asbestos of any type or mixture of types. According to MassDEP, an ACM is any material that contains greater than or equal to (≥) 1 percent asbestos.

5. Asbestos Materials—ACMs and materials that contain less than 1 percent (trace) asbestos.

6. Asbestos Wastes—All building materials and debris, insulation, disposable clothing and protective equipment, plastic sheeting and tape, exhaust systems or vacuum

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filters, or any abatement equipment that is or has been contaminated with asbestos and cannot be completely cleaned by vacuuming or by washing.

7. Authorized Visitors—Any visitor authorized by the GOVERNMENT, the GOVERNMENT, the GOVERNMENT or any representative of a regulatory agency or other agency having jurisdiction over the project.

8. Barrier—Any surface that seals off the work area to inhibit the movement of fibers.

9. Critical Barrier—A solid asbestos impermeable partition erected to constitute a work area closure; the outer perimeter of an asbestos work area, usually erected across corridors or other open spaces to complete containment.

10. Friable ACM—Material that contains 1 percent or more asbestos by weight and that can be crumbled, pulverized or reduced to powder by hand pressure when dry.

11. HEPA Filter—Equipment with a high efficiency particulate air (HEPA) filter, greater than 99.97 percent efficiency by 0.3-micron DOP (dioctyl phthalate) test and complying with American National Standards Institute (ANSI) Z9.2 (1979).

12. Non-friable Asbestos Material—Material that contains asbestos and that cannot be crumbled, pulverized or reduced to powder by hand pressure when dry.

13. Removal—All herein specified procedures necessary to strip all ACM and asbestos wastes from designated areas and to dispose of these materials at an acceptable site.

14. Regulated Area—A work area established to demarcate areas where airborne concentrations of asbestos exceed, or where there is a reasonable possibility they may exceed the permissible exposure limits. Only authorized individuals shall enter regulated areas.

15. Respirator—A device designed to protect the wearer from the inhalation of harmful atmospheres.

16. Visible Emissions—Any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

1.11 EMERGENCY PRECAUTIONS

A. The REMEDIATION CONTRACTOR shall develop and submit a written fire protection plan that specifically addresses fire protection during work. This plan shall be submitted to GOVERNMENT for review prior to the start of work.

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B. The REMEDIATION CONTRACTOR shall establish and maintain emergency and fire exits from the work areas. The REMEDIATION CONTRACTOR shall submit a written emergency evacuation plan to the City of Boston Fire Department and to the GOVERNMENT for review if applicable.

C. Local emergency medical personnel, both ambulance crews and hospital emergency room staff shall be notified prior to commencement of work as to the possibility of having to handle contaminated, injured workers, and they shall be advised on safe decontamination. The REMEDIATION CONTRACTOR shall submit copies of such notifications to the GOVERNMENT.

D. The REMEDIATION CONTRACTOR shall have a written Health and Safety Plan. When an injury occurs, the REMEDIATION CONTRACTOR shall stop work and implement fiber reduction techniques (e.g., water spraying) until the injured person has been removed from the work area.

E. Before the REMEDIATION CONTRACTOR starts any removal of the asbestos material, the REMEDIATION CONTRACTOR shall notify the local police and fire departments as to the proper personal protective equipment (PPE) required by persons providing emergency response services. The REMEDIATION CONTRACTOR shall make every effort to help these agencies form plans of action should their personnel need to enter contaminated areas.

1.12 SUBMITTALS

A. The REMEDIATION CONTRACTOR shall submit each item in this Article according to the Conditions of the Contract, for information only, unless otherwise indicated.

B. All submittals shall be submitted to the GOVERNMENT and the CONSULTANT prior to the start of work.

C. Abatement Plans shall include, at a minimum, the following:

1. Layout of project execution components showing the configuration of the containment and work area.

2. A description of Security System, warning signs and labels for waste containers.

3. Access routes to controlled asbestos work areas.

4. Copy of notification to police department, fire department and local ambulance and hospital.

5. A description of wetting agents and low pressure wetting system.

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6. Description of enclosures and work area controls to be used.

7. Fire Protection Plan, Safety Plan and Emergency Evacuation Plan.

8. Submit manufacturer's certification that vacuums, ventilation equipment and other equipment required to contain airborne asbestos fibers conform to ANSI Z9.2 and to requirements as listed in this Specification.

9. Safety Data Sheets (SDSs) for all products used on the project.

10. A detailed plan for the movement of material, personnel and waste in and out of work areas, building and the site.

11. Standard Operating Procedure showing how workers, visitors and employees will be protected from exposure and how spaces outside the work areas will be protected from contamination until completion of the work.

12. Written site-specific Health and Safety Plan to be developed and implemented for abatement work performed at the site. These procedures must ensure maximum protection of workers, visitors and employees from all health and safety issues and situations specific for this worksite that may or may not be foreseen. These procedures will include but are not limited to emergency escape procedures, fall protection, electrical hazards, etc.

D. To comply with applicable regulations, notify appropriate regulatory agencies of abatement activities.

1. Provide the required written notification at least 10 working days before the start of the asbestos abatement activity to the MassDEP and MADLS.

2. Provide required written notification by mail to local authorities as required.

3. Obtain and process all applicable forms and permits required.

E. Respiratory Protection System(s): Include literature describing sample respirators, hoses and certificate with system literature for the air supply system from manufacturer stating that air supply system meets specifications on quality, quantity and escape time. These submittals are required only if supplied air respiratory protection is used.

F. Obtain certification of compliance with OSHA requirements including but not limited to medical surveillance, record keeping and personal monitoring.

G. Obtain documentation of certification in accordance with Title 454 of the Code of Massachusetts Regulations (CMR), Part 28, for each employee.

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H. Document final landfill destination(s) and copies of transporter and Landfill permits as well as Waste Shipment Records

I. Maintain copies of all Notifications made to Massachusetts Asbestos Program, Local Board of Health, Local Fire Department and any other agencies, as required.

J. Apply for and obtain waivers and exemptions, which may be required by various regulatory agencies.

1.13 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only. The list provided below is not intended to be all inclusive of all regulations prevailing over the work.

B. U.S. Environmental Protection Agency (EPA):

1. Regulations for Asbestos (Title 40 of the Code of Federal Regulations (CFR), Part 61)
2. Guidance for Controlling Asbestos-Containing Materials in Buildings
3. A Guide to Respiratory Protection for the Asbestos Abatement Industry

C. U.S. Occupational Safety and Health Administration (OSHA):

1. Asbestos Construction Standard 29 CFR 1926.1101
2. Asbestos General Industry Standard 29 CFR 1910.1001
3. Respiratory Protection, 29 CFR 1910.134

D. National Institute for Occupational Safety and Health (NIOSH):

1. “Respiratory Protection A Guide for the Employee"

E. American National Standards Institute (ANSI):

1. Z86.1-1973—Commodity Specification for Air
2. Z9.2—HEPA Filter Specifications
3. Z88.2-1980—Respiratory Protective Equipment

F. Massachusetts Department of Labor Standards (MADLS)

1. The Removal, Containment, Maintenance, or Encapsulation of Asbestos (454 CMR 28)

G. Massachusetts Department of Environmental Protection (MassDEP)

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1. Amendments to Regulations 310 CMR 7.00, 7.09, 7.15 to Control Airborne Asbestos Emissions for the Control of Air Pollution

2. MassDEP Policy Statement Concerning Non-Friable Asbestos Containing Materials, Policy #BWP-96-012

H. U.S. Department of Transportation (DOT)

1. 49 CFR 171 – 180, Hazardous Materials Regulations

PART 2—MATERIALS AND EQUIPMENT

2.1 GENERAL

A. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner that shall not interfere with operation of others at the site or employee's access and safety, and must be authorized by the GOVERNMENT.

B. Damaged or deteriorated materials shall not be used and shall be promptly removed from the premises. Materials that become contaminated by asbestos materials shall be thoroughly cleaned, or sealed in plastic bags or sheeting, labeled and legally disposed of in an approved, secure landfill.

C. All materials and equipment shall comply, at a minimum, with all sections of this specification, applicable federal, state and local codes and industry standards.

2.2 ABATEMENT EQUIPMENT AND SUPPLIES

A. HEPA-Filtered Exhaust Fans—Air inside each interior work area shall be exhausted through a HEPA filter that is 99.97% efficient at 0.3 microns in particle size. Commercially manufactured HEPA-filtered exhaust units, with specification plates intact, must be provided for each work area to attain, at a minimum, four air volume changes per hour and an inward flow velocity of clean air into each work area at least 100 feet per minute. The HEPA filter shall be preceded by replaceable prefilters and the unit must be designed so that it cannot be operated unless all filters are in place. The units must also be designed with a gauge to indicate the pressure drop across filters, and lights and audible alarms to indicate that the filters are properly installed, functional, and when they must be changed. Flexible ducting shall be required to allow exhausting to the exterior of the building. No exhaust with any other type of particulate cleaning system (such as electrostatic precipitators) shall be allowed without prior written approval.

B. Polyethylene sheeting—only 6-millimeter, fire-retardant, polyethylene sheeting. Written authorization for use of an alternate product that meets Boston Fire Department requirements for flame retardancy must be issued.

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C. Ground fault circuit interrupters—Underwriters Laboratories Inc. (UL) listed ground fault circuit interrupters (GFCIs) will be used for all electrical connections.

D. Vacuum cleaners—all vacuum cleaners (UL listed) shall be emptied prior to being brought on site and shall have a HEPA filter as the final air filter that is 99.97% efficient at 0.3 microns in aerodynamic particle size.

E. Wetting Agent or Surfactant—shall be 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether, or equivalent, mixed in the proportion of 1 ounce of surfactant per 5 gallons of water. The material shall be odorless, nontoxic, nonirritating and noncarcinogenic. It shall be applied as a mist using a low-pressure sprayer recommended by the surfactant manufacturer.

F. Tape and Glue—shall be capable of sealing plastic joints and attaching plastic to finished surfaces. The bonding strength and resulting seal integrity shall not be affected by mist or water, wetting or encapsulating agent or any other materials to be used in the work area.

G. Warning Signs and Labels—shall comply with all federal, state and local codes and regulations.

H. Waste Containers and Transportation—shall be suitable for loading, temporary storage, transport and unloading of contaminated waste without risk of ripping, rupture or exposure to persons, or emissions to the atmosphere. Transportation methods shall comply with the provisions of 40 CFR 61, Subpart M, and with any and all state and local hazardous or special waste regulations for temporary storage, transport and disposal if such codes are enforced in states in which the waste will be stored, transported or disposed.

I. Truck Liners—shall be polyethylene or equivalent with a thickness of at least 10 millimeters for all applications.

J. Scaffolding—scaffolding, lifts, ladders and aerial equipment as required to accomplish the specified work shall meet all applicable safety regulations.

K. Transportation Equipment—as required, shall be suitable for loading, temporary storage, transport and unloading of contaminated waste without exposure to persons or property. The equipment shall be secured at all times and access restricted to unauthorized personnel.

2.3 SAFETY SUPPLIES AND EQUIPMENT

A. Respirator Types—Provide all workers with a full or half-face respirator that is approved by NIOSH/Mine Safety and Health Administration (MSHA) for protection against airborne

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asbestos and that meets the requirements of the OSHA Asbestos Standard. Minimum respiratory protection required shall be compliant with current OSHA and MADLS regulations including 454 CMR 28 and 29 CFR 1926.1101.

B. Protective Clothing—Provide all workers and approved visitors with disposable coveralls, head and foot coverings, gloves, eye protection (i.e., safety glasses) and half-face respiratory protection including replacement HEPA-filter cartridges.

PART 3—EXECUTION

3.1 COORDINATION AND SCHEDULING

A. The REMEDIATION CONTRACTOR shall coordinate all work with the GOVERNMENT and the CONSULTANT.

B. The REMEDIATION CONTRACTOR shall submit to the GOVERNMENT, prior to contract performance, a schedule of work including sequencing of asbestos removal areas and demolition.

C. The REMEDIATION CONTRACTOR shall give no less than a two-week advance notice of proposed time for shutting down or interrupting any utility, service or facility that may affect normal facility operations.

D. The REMEDIATION CONTRACTOR shall make all required notifications and obtain all permits including but not limited to MassDEP and MADLS. All associated costs and fees shall be paid for by the REMEDIATION CONTRACTOR and included in the base bid price.

3.2 RESPIRATORY PROTECTION SYSTEMS

A. Provide all workers and authorized visitors with NIOSH-approved respirators compliant with OSHA regulations and a sufficient quantity of disposable filters, so that workers can change filters during the workday.

B. Workers shall always wear a respirator properly fitted on the face while within the work area. Any worker failing to wear his/her respirator or in any way performing his/her work in an unsafe manner shall be restricted from working at this site.

C. Instruct and train workers in proper respirator use.

3.3 PROTECTIVE CLOTHING

A. Provide to all workers, supervisors, superintendents and authorized visitors and inspectors protective disposable clothing consisting of full-body coveralls, head covers, gloves and 18-inch-high, boot-type covers or reusable footwear as required by job conditions and safety regulations.

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B. Provide eye protection and hard hats as required by job conditions and safety regulations.

C. Reusable footwear, hard hats and eye protection devices shall be properly stored while not in use or until the end of the remediation work.

D. All disposable protective clothing shall be discarded and disposed of as asbestos waste every time the wearer exits the work area.

E. Provide all personnel throughout the abatement process with the specified protective clothing and gear. Ensure that all personnel entering and leaving the workspace use the following procedures:

1. Entering from the Outside: Don protective clothing and wear clean protective gear.

2. Exiting from the Work Area: Dispose of all protective clothing into labeled plastic bags for asbestos waste.

3. Post written procedures in the workplace and train all personnel on the procedures for the evacuation of the injured and the handling of potential fires. Provide aid to a seriously injured worker without delay for decontamination. Make provisions to minimize exposure of rescue workers and to minimize spreading of contamination during evacuations and fire procedures. Exceptions to normal, routine-exiting procedures shall be made for emergencies such as but not limited to serious personal injury and fires.

4. The REMEDIATION CONTRACTOR shall instruct all employees and workers in the proper care of their personally issued respiratory equipment, including daily maintenance, sanitizing procedures, etc.

F. All respiratory equipment shall be inspected by the REMEDIATION CONTRACTOR's personnel at the beginning of each work period, including breaks and lunch periods.

3.4 GENERAL PREPARATION PROCEDURES

A. Upon receipt of a Notice to Proceed, the REMEDIATION CONTRACTOR shall meet at the site with the GOVERNMENT and the CONSULTANT to reach agreement on:

1. Scope and manner of work performance and all schedules

2. Contractor and supporting vendor vehicle access and parking

3. Access to the work areas, including approved doors, stairways and corridors

4. Location of water supply and wastewater drain connection points, if available

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5. Determination of all equipment and other items to be removed from the work areas, and the location of temporary storage space, if applicable

6. Any other logistical factors to minimize interference with public safety and health, and other contractor activities.

B. For the removal of ACM, the REMEDIATION CONTRACTOR shall isolate the work area in a manner that is sufficient to control dust generated during work including:

1. Six (6)-millimeter polyethylene sheeting shall be placed under the work area. The poly-sheeting shall be taped to the side walls under the work, extending a minimum of 10 feet beyond the area of removal.

2. Cover all non-moveable objects under the removal work area using 6-millimeter poly-sheeting.

3. The removal work area shall be demarcated using appropriate signage and barrier/caution tape and be placed at the entrance to each removal work.

4. Operate HEPA-Filtered Exhaust Fans in the work area. If feasible, as determined by the USER AGENT or CONSULTANT, these shall be routed outdoors.

5. Worker decontamination area: The REMEDIATION CONTRACTOR shall establish a personnel decontamination area (PDA) and waste decontamination area (WDA), and ensure that the PDA is the only location where workers egress the work area. The PDA shall be contiguous to the work area to prevent inadvertent cross contamination of asbestos into adjacent areas. The PDA shall be sized in a manner to sufficiently allow for personnel access, and the decontamination and removal of contaminated coveralls and/or clothing and containerization of contaminated PPE. The REMEDIATION CONTRACTOR is responsible for determining the exact size and configuration of the PDA. At a minimum, the PDA shall consist of two layers of 6-millimeter polyethylene sheeting placed on the floor. PDA shall be kept clean for the duration of the work, maintaining it free of asbestos materials, contaminated equipment, PPE, etc.

C. Prepare each work area according to the following general sequence of procedures to ensure that proper fiber containment and protection systems are installed before any work, which could generate airborne asbestos fibers and ensure that all utilities leading to the work area have been locked-out and tagged-out by a licensed electrician.

1. Establish work area, PDA, and WDA as required.

2. Perform pre-cleaning/surface decontamination where appropriate prior to installing protective poly sheeting.

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3. Isolate and seal airtight with plastic and tape all HVAC return system openings in the interior work areas.

4. Obtain formal approval from the CONSULTANT of all preparation work and containment areas before commencing asbestos material removal. The CONSULTANT shall be given at least 48 hours notification of the intent to start removal work in any work area.

D. Isolation of Electrical Systems

1. The scope of the electrical isolation work covers the protection of electrical equipment that is in areas where asbestos removal work is performed and where the water used for wetting the material before or during removal could possibly contact the equipment and create a hazard.

2. Provide portable electrical panels with ground fault protection for all non-battery power requirements. These panels shall have sufficient capacity for all HEPA exhausts and vacuums, power tools, portable lighting, and all other electrical needs.

3. Provide a licensed electrician to perform all electrical work including, but not limited to connecting, energizing, and de-energizing the electrical panels and to be on call to handle any electrical problem, which may arise during the course of the work.

4. All materials and workmanship shall comply with the latest editions of applicable codes, standards, and specifications.

5. Once a work area becomes isolated by containment, only weatherproof lighting and washable tools and equipment will be allowed in the area.

3.5 DECONTAMINATION FACILITIES

A. Description—Any person or thing exiting from the work areas must pass through the PDA or WDA. All containers passing through the WDA must be cleaned thoroughly before exiting the facility. All asbestos materials shall be containerized and disposed of as an asbestos-containing waste material.

B. Construction—PDAs and WDAs shall be constructed and maintained as specified in applicable regulations and shall be located in areas approved by the GOVERNMENT and CONSULTANT.

C. All personnel shall enter the PDA and put on clean protective clothing and respirators; then put on any additional equipment and enter the work area. All personnel exiting the work area shall enter the PDA, remove and store or dispose of all contaminated clothing and PPE.

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D. Cleaning—the PDA and WDA shall be cleaned using a HEPA-filtered vacuum at least once every shift or more frequently, if needed, to prevent dust accumulation.

E. Prohibitions—Smoking, drinking, or eating shall not be permitted in any work area, WDA, or PDA.

3.6 APPROVAL OF CONTAINMENT AREAS

A. After the work area has been prepared as specified, the REMEDIATION CONTRACTOR shall request an inspection by the CONSULTANT. No removal or disturbance of asbestos materials is to occur until the CONSULTANT has inspected and approved each separate prepared work area.

B. Any deficiencies in the preparation work shall be promptly corrected in a manner satisfactory to the CONSULTANT.

3.7 ASBESTOS REMOVAL PROCEDURES

A. General Procedures

The removal of interior non-friable materials must be performed within a regulated area, with protective ground covering, and the material wetted with amended water and carefully removed (not dropped). Removal of interior friable materials must be removed under full negative pressure enclosure.

1. The ASBESTOS ABATEMENT SUB-CONTRACTOR shall remove all movable objects/ items stored in abatement areas unless otherwise specified.

2. Thoroughly wet ACMs to be removed prior to stripping, handling, or tooling to reduce fiber dispersal into the air. Accomplish wetting by a fine spray (mist) of amended water, or penetrating/removal encapsulant (wetting agent). Allow sufficient time for the wetting agent to penetrate material thoroughly. If a removal encapsulant is used, apply in accordance with manufacturer’s instructions. Perforate outer covering of any material that has been painted and or jacketed to allow penetration of wetting agent. Removal of ACM shall be performed while simultaneously spraying wetting agent on the material.

3. Continuously mist the work area with amended water to reduce airborne fiber levels.

4. Dry sweeping is strictly prohibited.

5. Use HEPA vacuum during the abatement activity and prevent the accumulation of settled asbestos dust or debris inside of the abatement area.

6. No unnecessary dust generation activities shall be permitted during abatement.

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7. Remove wetted ACM in small sections from the source location. Do not allow the material to dry out.

8. Place ACWM, while still wet, into disposal bags, twist the top of the bag, bend over and seal (goose-neck), with a minimum of three wraps of duct tape. The ACWM in the bag must be adequately wet.

9. Clean the outside of the bag and move to the wash down station adjacent to the material decontamination unit/waste load-out area.

10. Place ACWM bag inside another ACWM bag (double-bag).

3.8 WORK AREA CLEANUP, DECONTAMINATION AND WASTE DISPOSAL

A. General Requirements

1. After all ACMs have been removed, remove all ACWM and perform a final cleanup and decontamination of each work area. Final cleaning shall be performed only after all ACWM is packaged and removed, but before reinstalling or demolishing any equipment, or dismantling any barrier, decontamination area, or protective coverings. Cleaning shall be subject to the approval of the CONSULTANT based on a visual inspection.

B. Cleaning Methods and Approvals

1. All waste containers and removal equipment shall be thoroughly cleaned with a HEPA-filtered vacuum, decontaminated with the use of amended water, and then promptly removed from the work area.

2. All surfaces in the work area shall be thoroughly wiped/washed clean and, after drying, thoroughly decontaminated with a HEPA-filtered vacuuming device.

3. After cleaning, the CONSULTANT shall inspect the work area. To facilitate scheduling of inspections, the REMEDIATION CONTRACTOR shall notify The CONSULTANT of the anticipated completion of the final work area cleaning at least 48 hours in advance. Final visual inspection(s) for the Work Area, shall be conducted in accordance with 454 CMR 28.10 (9)—*Clearance Monitoring Procedures* and 310 CMR 7.15 (8)—*Visual Inspection* as well as applicable federal regulations.

4. If any visible waste, dust, debris, or materials specified for removal are observed within the work area during the inspection, the REMEDIATION CONTRACTOR shall perform additional cleanup and decontamination.

5. Once waste containers and equipment have been properly packaged and removed

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from the work area as contaminated waste, package and properly dispose of all remaining plastic sheeting, disassemble and remove the decontamination area and HEPA exhausts, and perform a final HEPA vacuuming and/or wet cleaning of all surfaces.

C. Waste Disposal

1. General Requirements—All asbestos wastes must be handled, packaged, stored, transported, and disposed of as specified in this subsection, and in compliance with all federal, state, and local regulations and codes.

2. Waste Labeling—If waste containers are not already so pre-printed, warning labels having waterproof print and permanent adhesive shall be affixed to the lid and/or sides of the containers, whether or not these containers are further packaged. Warning labels shall be conspicuous and legible, and conform to the latest OSHA, EPA and DOT labeling requirements.

3. Waste Packaging—All asbestos waste shall be thoroughly wetted when packaged and the REMEDIATION CONTRACTOR shall inspect each bag, drum or container to observe that water condensation is visible. Insufficiently wetted bags shall be opened, rewetted, and resealed inside a negative pressure enclosure. When a waste bag is full, it shall be securely sealed with tape, and then placed in the designated temporary storage area inside of the work area.

D. Waste Container Removal and Disposal Documentation

1. The REMEDIATION CONTRACTOR shall coordinate the removal of asbestos materials from the building with the GOVERNMENT and the CONSULTANT. Asbestos waste shall be appropriately containerized and transported using wheeled carts or carried by hand. The REMEDIATION CONTRACTOR is responsible for ensuring that no building damage will occur during waste handling and transport.

2. If is stored on site, it will be in a designated storage area and be located in a secured, weatherproof enclosure.

3. It is the responsibility of the REMEDIATION CONTRACTOR to determine current waste handling, transportation, and disposal regulations for the worksite and for each waste disposal landfill. The GOVERNMENT must approve the landfill destination. The REMEDIATION CONTRACTOR must comply fully with these documents and all DOT and EPA requirements.

4. The REMEDIATION CONTRACTOR, transporter and landfill shall document generation, transport and disposal of the asbestos waste at the designated landfill by completing a Waste Shipment Record and forwarding the original along with the Bill of Lading to the GOVERNMENT within the 30-day time period specified by EPA.

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5. Measure the volume of each container or load of ACWM removed from the Site. The REMEDIATION CONTRACTOR shall provide the CONSULTANT with an estimated total volume of each load/container of waste and provide an accurate count of each type of container for each load BEFORE the waste is removed from the Site.

6. Provide legal transportation of the asbestos waste to the disposal landfill, and complete or obtain all required licenses, manifests, dump slips, or other forms. Proper truck placarding must be performed in accordance with DOT regulations. Legible copies of all forms or licenses, and the signed original of the Waste Disposal Form (e.g., Asbestos Waste Shipment Record) for each waste load, shall be given to the GOVERNMENT.

3.9 MONITORING, TESTING, AND INSPECTIONS

A. All air monitoring, with the exception of the REMEDIATION CONTRACTOR personnel monitoring (for OSHA compliance), will be performed by the CONSULTANT. The REMEDIATION CONTRACTOR is responsible for personnel monitoring in compliance with OSHA regulations. The CONSULTANT may, at his or her discretion, also conduct personnel monitoring on REMEDIATION CONTRACTOR personnel. Monitoring by the CONSULTANT shall not relieve the REMEDIATION CONTRACTOR of obligation to perform personal exposure assessments.

B. The performance and execution of the work will be closely monitored by the CONSULTANT. The monitoring will be inside the work areas and surroundings to evaluate compliance with these specifications and applicable regulations. The REMEDIATION CONTRACTOR shall provide cooperation and support to the CONSULTANT throughout the abatement process. The monitoring may include air samples in the workspace, personnel samples at breathing levels for a number of workers to be determined solely by the CONSULTANT, air samples in the areas surrounding the work area and the outside, checking of the standard operating procedures, engineering control system, respiratory protection system, labeling, packaging, transporting and disposal of asbestos, decontamination facilities and procedures and any other aspects of the abatement process that may impact the health and safety of the public or the pollution of the environment. This monitoring is further intended to document type and quantities of asbestos materials removed and to evaluate the REMEDIATION CONTRACTOR compliance with regulations and the Contract Documents.

C. The REMEDIATION CONTRACTOR is responsible for meeting OSHA requirements for their personnel, including but not limited to, monitoring requirements, safety compliance and record keeping. Personal monitoring results from the previous day shall be posted each day, and legible copies of the results forwarded to the CONSULTANT.

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D. The REMEDIATION CONTRACTOR shall not start containment dismantling operations until REMEDIATION CONTRACTOR has received approval from the CONSULTANT.

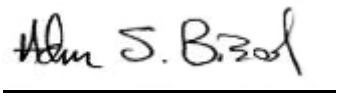
3.10 FINAL INSPECTION AND TESTING

A. After thorough cleaning and removal of all asbestos waste and materials, tools and equipment, the REMEDIATION CONTRACTOR's Asbestos Supervisor shall perform an initial inspection of the work area to determine if it is ready for a final visual inspection by the CONSULTANT. Once REMEDIATION CONTRACTOR has determined that the containment or regulated work area is ready for the final visual inspection, the CONSULTANT shall be notified no less than 48 hours in advance to schedule and perform the required final inspection and final clearance air testing. The CONSULTANT will visually inspect the work area for visible waste, dust, debris, or materials specified for removal or contamination. All surfaces shall be dry before the visual inspection.

B. After the specified post-abatement levels have been confirmed through the final inspection specified herein, the work area can be deconstructed and disposed of as asbestos waste. A final check will be carried out by the CONSULTANT to ensure that no dust or debris remain on surfaces as the result of asbestos removal and related activities and containment dismantling operations.

C. After achieving the level of cleanliness and decontamination as specified herein and as confirmed by the final inspection, the CONSULTANT and GOVERNMENT will thoroughly inspect the work areas jointly with the REMEDIATION CONTRACTOR to determine whether any damage has been done to any building component, finish, equipment or any other part of the workspace or property that will not be subsequently demolished or have been specifically designated for salvage. A final inspection report shall be prepared jointly between the CONSULTANT and the GOVERNMENT detailing the list of items to be fixed by the REMEDIATION CONTRACTOR.

Prepared by Adam S. Bisol, Massachusetts Asbestos Designer #AD034163.



END OF SECTION

Attachments:
Appendix A: Asbestos-containing Materials, Location, Description, and Estimated Quantity
Appendix B: Figure B.1 Asbestos-containing Materials

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Appendix A
Asbestos-containing Materials
Location, Description, and Estimated Quantity

Note: ACM locations are reflected in the Appendix B plan.

Table A.1 Regulated[1] Asbestos-containing Materials, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, May 29, 2024

Suspect Material Code	Material Description	Material Location(s)	Percent Asbestos and Type	Approximate Quantity
TSI 1	White, magnesia pipe run insulation	Rear elevation (stone block wall) of quarters, running from outside the building to the garage, concealed behind wall in bathroom	17-27% CHR	50 LF
TSI 2	White, hand-packed, cloth wrapped elbow insulation		25-28% CHR	10 EA
CB 1	Grey cement board	Garage ceiling	16-18% CHR	300 SF
FC 3	Residual frame caulk, brick to wood trim	Garage bay doors	3% CHR	100 LF
WGC 3	Exterior, white glazing compound on wood	Quarters, wood framed windows	5% CHR	50 SF
WGC 4	Grey glazing compound	Garage skylights, intraframe	5% CHR	100 SF

CHR chrysotile
LF linear feet
EA each
SF square feet

[1] Regulated asbestos-containing materials are building materials determined to contain ≥1.0% asbestos by polarized light microscopy (PLM). Trace amounts of asbestos in regulated concentrations (<1.0% asbestos) is considered an asbestos-containing waste material and is included as a regulated material.

Blue shading denotes one or more samples of the material were determined to be ACM, containing asbestos in regulated concentrations (≥1.0% asbestos).

Samples analyzed using polarized light microscopy (PLM) by Asbestos Identification Laboratory (AIL), Woburn, Massachusetts. AIL is accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program for asbestos analysis of bulk samples by PLM with dispersion staining: 200929-0. Samples analyzed for chrysotile, amosite, crocidolite, actinolite, tremolite, and anthophyllite type asbestos fibers.

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SECTION 040322 – BRICK MASONRY REPAIR AND CONSTRUCTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Removal of plant growth and cleaning.
2. Brick reconstruction required where indicated or required.
3. Mortar.
4. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. Section 055000 - "Metal Fabrications" for replacement masonry lintels.
2. Section 076200 - "Sheet Metal Roofing, Flashing and Trim" for sheet metal flashing.
3. Section 079200 - "Joint Sealants" for sealing control and expansion joints in unit masonry.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on exterior historic mortar as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.
2. Existing Mortar: Test according to ASTM C1324, modified as agreed by testing service and Contracting Officer for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis to supplement microscopical methods. Carefully remove existing mortar for testing from within joints at five locations designated by Contracting Officer or testing service.

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3. Temporary Patch: As directed by Contracting Officer, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Selection: For the following:

1. Colored mortar to match existing.

C. Samples for Verification: For each type and color of the following:

1. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project**.** Label Samples to indicate types and amounts of pigments used.
2. Accessories embedded in masonry.

D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For new exposed brick, include material test report for efflorescence according to ASTM C 67.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Joint reinforcement.
5. Anchors, ties, and metal accessories.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

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F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Samples: Build samples of repointing mortar to verify material selections of mortar color, and joint tooling. Comply with requirements in Division 1 Section "Quality Requirements" for mockups. If samples are disapproved, provide additional samples as necessary to obtain approval by Contracting Officer.

1. Approval of samples is for color, texture, and relationship of mortar colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Contracting Officer in writing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

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1.07 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Stain Prevention: Prevent mortar, and soil from staining the face of masonry to be left exposed. Immediately remove mortar, and soil that comes in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.08 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date, to avoid delaying completion of the Work.
B. Perform masonry restoration work in the following sequence:

1. Remove plant growth.

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2. Clean existing masonry in areas of plant growth.
3. Perform repairs indicated on drawings and in this section.
4. Rake out joints that are to be repointed.
5. Point mortar joints.
6. Clean masonry surfaces of excess mortar.

C. Scaffolding: If scaffolding is used, patch anchor holes used to attach scaffolding after scaffolding removal. Patch holes in mortar joints to comply with Part 3 "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.01 BRICK

A. Face Brick and Accessories: Provide face brick and accessories where required to complete masonry restoration work.

B. Reuse of salvaged brick: In so far as possible, use salvaged brick within a wall surface of existing brick. Where quantities of undamaged salvaged brick is not available, provide new brick matching historic brick. Brick from the following suppliers may be required:

1. The Stiles and Hart Brick Company.
2. Vermont Brick Company.
3. Morin Brick Company.

C. Size: Provide bricks matching the size of the existing building bricks. Match joint size of new construction with joint size of existing historic building. If necessary, obtain stringent requirement for brick size by culling.

1. Color: Matching existing building in color and range.
2. Texture: Matching existing.
3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4400 psi.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Application: Use where brick is exposed, at restoration work, unless otherwise indicated. Align coursing with existing.

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2.02 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II. Provide natural color or white cement as required to produce mortar color matching existing.

B. Hydrated Lime: Natural hydrated lime. Type N.

C. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand, color-matched to sand in existing mortar.

D. Water: Potable.

E. Mortar pigments; natural iron oxides. For use only when mortar color cannot be achieved by varying cement color or type.

2.03 MORTAR MIXES

A. General: Do not use admixtures, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

B. Mortar: Type O (1 part by volume Portland Cement, 2 parts lime, 8 parts sand) - color to be adjusted as necessary by changing to part white cement or part Type II cement or colored sands as required. Adjustments to this mix may be made after review of the testing of the historic mortar.

2.04 TIES AND ANCHORS

A. Materials: Where required by good construction practice, provide ties and anchors from stainless steel at all exterior walls and cavity wall construction.

1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
2. Stainless-Steel Sheet: ASTM A 666, Type 304.
3. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

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B. Corrugated Metal Ties for use within Solid Masonry Construction: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from not less than 0.053 inch thick.

C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

2.05 MISCELLANEOUS ANCHORS

A. Post-installed Anchors: Provide torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.06 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Install metal flashing, where flashing is exposed or partly exposed and where required or indicated, complying with SMACNA's "Architectural Sheet Metal Manual and Section 076200 - "Sheet Metal Flashing, Roofing and Trim."

2.07 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

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D. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long. Cut flush at exterior.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide the following configurations:

a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.

2. Provide one of the following or an approved equal:

a. Advanced Building Products Inc.; Mortar Break II.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

2.08 PAINT REMOVERS

A. Low-Odor, Solvent-Type Paint Remover: Manufacturer's standard low-odor, water-rinsable solvent-type gel formulation, containing no methanol or methylene chloride, for removing paint coatings from masonry.

B. Available Products:

1. American Building Restoration Products, Inc.; 800 No Lye Grip 'N Strip, Super Bio Strip Gel or Super Bio Strip Paste.
2. Dumond Chemicals, Inc.; Peel Away 6.
3. ProSoCo; Enviro Klean NMC or Enviro Strip #3.

2.09 CLEANING MATERIALS

A. For water cleaning: Potable water. Use hot water if possible.
B. For solution cleaning:

1. Field-mixed solution:

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a. Bleach: Household-type bleach such as Clorox.
b. Detergent: Tetrasodium polyphosphate (TSPP).
c. Preparation of solution: Mix ¼ cup of TSPP, ½ cup Clorox, and 20 quarts of water for every 5 gallons of solution required.

2. Manufactured solution: ProSoCo "Biowash".

C. Excess mortar removers for final cleaning: SureKlean 101 or Hydroclean 455.

PART 3 - EXECUTION

3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and projections to protect from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar in contact with exposed masonry and other surfaces.
4. Clean mortar splatters from scaffolding at end of each day.

3.02 UNUSED HARDWARE AND EQUIPMENT REMOVAL

A. Remove masonry hardware, brackets, wood nailers, unused conduits and equipment boxes, electrical, lighting or alarm panels, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.

1. Remove items carefully to avoid spalling or cracking masonry.
2. If item cannot be removed without damaging surrounding masonry, cut off item flush with surface and core drill surrounding masonry and item as close around item as practical.

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3. Patch holes where items were removed unless directed to remove and replace units. If a brick is substantially damaged, remove the brick and replace – do not patch with mortar. Maintain coursing at replacement or repair, toothing in bricks as necessary.
4. Finished work should not show evidence of previous hardware or equipment installation.

3.03 PAINT REMOVAL

A. General: Paint removal is not indicated on drawings; typical paint on masonry is overspray or drips from historically painted elements.

B. Paint Removal with Solvent-Type Paint Remover:

1. Apply thick coating of paint remover to painted masonry with natural-fiber cleaning brush, deep-nap roller, or large paint brush.
2. Allow paint remover to remain on surface for period recommended by manufacturer. Agitate periodically with stiff-fiber brush if recommended by manufacturer.
3. Rinse with hot water applied by medium-pressure spray (not to exceed 500 psi) to remove chemicals and paint residue.

3.04 MASONRY CLEANING

A. General: Clean all exterior masonry, including areas where other repairs are indicated.

1. Proceed with cleaning in an orderly manner; work from top to bottom of each elevation and from one end of each elevation to the other.
2. Use only those cleaning methods indicated for each material and location.

    a. Use spray equipment that provides controlled application at 600 psi, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage stone.
    b. For water spray application, use fan-shaped spray tip that disperses water at an angle of 15 degrees.

3. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging stone surfaces.
4. Removing Plant Growth: Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allow to dry as long as possible before removal. Remove loose soil or debris from open joints to whatever depth they occur.

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5. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, caulking, asphalt, and tar.

    a. Carefully remove heavy accumulations of material from surface of masonry with sharp chisel. Do not scratch or chip masonry surface.
    b. Remove paint with alkaline paint remover; remove caulking and sealants first by scraping, then remove remainder with special-purpose product. Repeat applications up to two times if needed.
    c. Where asphalt or tar remains on surface of masonry, remove it with proprietary chemical cleaners formulated for this purpose.

6. Water Cleaning: Unless otherwise indicated, hold spray nozzle at least 12 inches from surface of stone and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
7. Solution cleaning: At areas of organic growth not removed by water cleaning, apply cleaning solution as indicated below:

    a. Pre-wet masonry surface.
    b. Scrub-apply cleaning solution.
    c. Rinse with cold water applied by medium-pressure spray to remove solution and soil.

8. Pressure rinse all surfaces after cleaning.
9. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.05 BRICK REMOVAL, SALVAGE AND REINSTALLATION

A. At locations indicated, where required by building operations, as required by the finished work, or at locations where existing bricks are damaged, spalled, or deteriorated, install salvaged historic brick in good condition. At salvage and reinstallation areas, carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

    1. When removing damaged single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

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C. Notify Contracting Officer of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. At large salvage areas, remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Store brick for reuse, as indicated.
3. Deliver cleaned brick not required for reuse to Government, unless otherwise directed.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Install replacement brick into bonding and coursing pattern of existing brick. Tooth in brickwork to continue bonding patterns. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

G. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.

1. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to match existing masonry. Follow the requirements for repointing of historic masonry.

3.06 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

3.07 COMPOSITE MASONRY AT HISTORIC CONSTRUCTION

A. Where reworking of historic composite masonry is required, bond wythes together using one of the following methods:

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1. Individual Metal Ties: Provide ties installed in horizontal joints, but not less than one metal tie for 2 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

    a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 8 inches o.c.
2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.08 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

    a. Reinforcement above is in addition to continuous reinforcement.

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B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.09 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing or concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached and seismic anchors to masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

3.10 LINTELS

A. Install steel lintels where indicated or directed.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

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2. At multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building felts, lapping at least 4 inches.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
6. install flashing flush with exterior face of wall.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Space weep holes formed from plastic tubing 16 inches o.c.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

3.12 FIELD QUALITY CONTROL

A. Inspectors: Engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

D. Prism Test: For each type of construction provided, per ASTM C 1314 at 28 days.

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3.13 REPOINTING

A. Repoint brick as indicated on the drawings.

B. Rake out joints as follows:

1. Rake out mortar, sealant, tar and other joint fillers to two and one half times the width of the joint, or to sound mortar, whichever is greater.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Contracting Officer.
4. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and mallet. Strictly adhere to written quality-control program. Quality-control program shall include provisions for demonstrating ability of operators to use tools without damaging masonry, supervising performance, and preventing damage due to worker fatigue.

C. Notify Contracting Officer of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

D. Point joints as follows:

1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so that, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar over edges onto exposed masonry surfaces or to featheredge mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.

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E. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.

1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

3.14 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure. Do not use metal scrapers or brushes.

B. For any mortar remaining after the above procedures, apply excess mortar removers, diluted to minimum effective concentration.

C. Wash adjacent woodwork and other non-masonry surfaces. Use detergent and soft brushes or cloths.

D. Sweep and rake adjacent pavement and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

3.15 MASONRY WASTE DISPOSAL

A. Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site and legally dispose of off Government's property.

END OF SECTION

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Loose steel lintels.
2. Steel flitch plates.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Steel channels, angles, plate, metal trim and framing for applications where framing and supports are indicated in the Architectural drawings but not indicated in sections of the specifications other than this one.

B. Related Sections include the following:

1. Section 061000 - "Rough Carpentry" for metal framing anchors and other rough hardware.
2. Section 099123 - “Painting” for epoxy priming of galvanized metal fabrications and finish painting of ferrous and galvanized metal fabrications.

1.03 SUBMITTALS

A. Product Data: For the following:

1. Grout.
2. Paint.

B. Sustainable Design Submittals:

1. Environmental Product Declaration: For each product.
2. Health Product Declaration: For each product.

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C. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.06 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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1.07 PERFORMANCE REQUIREMENTS

A. See Section 061000 – "Rough Carpentry" Paragraph 1.4 B for Delegated Design related to the design of flitch plates at the canopy structure, including attachment to existing building construction.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet, Cold Rolled: ASTM A1008/A1008M and ASTM A109 / A109M, either commercial steel or structural steel, exposed.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

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G. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

H. Malleable-Iron Castings: ASTM A 47, Grade 32510.

I. Gray-Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

J. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

K. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

L. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

M. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

N. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.03 PAINT

A. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.

1. Products: Subject to compliance with requirements, provide one of the following or approved equal:

a. Carboline 621; Carboline Company.
b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
c. Tneme-Zinc 90-97; Tnemec Company, Inc.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for galvanizing welds in steel, complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

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2.04 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3.

E. Lag Bolts: ASME B18.2.1.

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1.

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

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C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

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2.06 LOOSE STEEL LINTELS

A. Loose steel lintels are lintels not attached to other steel structure but simply bearing on masonry.

B. In general, provide new loose steel lintels at all locations indicated or directed where the work requires the replacement of existing loose steel lintels.

C. Weld adjoining members together to form a single unit where the schedule indicates multiple angles.

D. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.

E. Galvanize loose steel lintels located in exterior walls.

MINIMUM LINTEL SCHEDULE (NON LOAD BEARING WALLS ONLY)				
WALL THICKNESS	CLEAR SPAN			
	4'-0" OR LESS	4'-1" TO 5'-4"	5'-5" TO 6'-4"	6'-5" TO 8'-0"
3-5/8"	3-1/2x3-1/2x1/4	4x3-1/2x1/4	5x3-1/2x5/16	5x3-1/2x5/16
5-5/8"	5x5x5/16	5x5x5/16	5x5x5/16	5x5x5/16
7-5/8"	(2) 3-1/2x3-1/2x1/4	(2) 3-1/2x 3-1/2x1/4	(2) 3-1/2x 3-1/2x1/4	(2)5x3-1/2x5/16
9-5/8"	(2) 4x4x1/4	(2) 4x4x1/4	(2) 4x4x1/4	(2) 4x4x3/8
11-5/8"	W8x24 + C12x20.7	W8x24 + C12x20.7	W8x24 + C12x20.7	W8x24 + C12x20.7

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

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C. Galvanize miscellaneous framing and supports at exterior locations and elsewhere where indicated.

2.08 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.09 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

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3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

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SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building framing with dimensional lumber or engineered wood products.
2. Equipment bases and support curbs.
3. Wood furring, grounds, nailers, and blocking.
4. Wall and roof sheathing.
5. Plywood backing panels.

B. Related Sections include the following:

1. Section 012300 - “Alternates” for an alternate affecting the work of this section.
2. Section 055000 - "Metal Fabrications" for plate steel used within flitch beams.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Delegated-Design Submittal: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements” for structural review of the soundness of the existing canopy columns, review of loading and attachments of the canopy structure to the columns, attachment of the ledger at the existing building, beam and joist sizes and attachments, including

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analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Comply with IBC loading requirements. See Section 055000 – "Metal Fabrications" for requirements for steel plates for flitch beam at canopy.

C. Product Data for the following products:

1. Metal framing anchors.
2. Construction adhesives.

D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

F. Warranty of chemical treatment manufacturer for each type of treatment.

G. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.

1. Engineered wood products.
2. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

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1. Dimension lumber framing.
2. Laminated-veneer lumber.
3. Plywood roof and wall sheathing.
4. Parallel-strand lumber.
5. Prefabricated wood I-joists.
6. Rim boards.
7. Miscellaneous lumber.

C. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational

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engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Provide preservative treated wood at all exterior locations.

B. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

E. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.

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3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Framing for non-load-bearing partitions.
3. Framing for non-load-bearing exterior walls.
4. Roof construction.
5. Plywood backing panels.

2.4 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

2.5 DIMENSION LUMBER FRAMING

A. Provide the following grades unless higher grade of increased strength is required as indicated in the structural drawings.
B. Load-Bearing Partitions: No. 2 grade.

1. Application: Interior load-bearing partitions.
2. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.

C. Ceiling Joists: Construction or No. 2 grade.

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1. Species:

    a. Hem-fir (north); NLGA.
    b. Southern pine; SPIB.
    c. Douglas fir-larch; WCLIB or WWPA.
    d. Douglas fir-larch (north); NLGA.

D. Joists, Rafters, and Other Framing Not Listed Above: Select Structural grade.

1. Species:

    a. Hem-fir (north); NLGA.
    b. Southern pine; SPIB.
    c. Douglas fir-larch; WCLIB or WWPA.

2.6 ROOF SHEATHING

A. Plywood Sheathing, Roofs: DOC PS 1, Exposure 1, Structural I sheathing.
Span Rating: Not less than that required by center to center dimension of supports.
Thickness: Not less than existing.

2.7 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.

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3. Spruce-pine fir(south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NeLMA.
5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.8 BACKING PANELS

A. Network, Communications, Telephone and Electrical Equipment Backing Panels: Plywood DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness. Back prime and paint on all six sides.

2.9 METAL FRAMING ANCHORS

A. Provide the following anchors unless higher grade of increased strength is required as indicated in the structural drawings.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M,

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G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

E. Joist Hangers: U-shaped joist hangers with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.

1. Thickness: Minimum 0.062 inch.

F. I-Joist Hangers: U-shaped joist hangers with 2-inchlong seat and 1-1/4-inch- wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.

1. Thickness: Minimum 0.062 inch.

G. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: 2 inches.
2. Thickness: Minimum 0.062 inch.

H. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.

I. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: 1-1/4 inches.
2. Thickness: Minimum 0.062 inch.
3. Length: As indicated.

2.10 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

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E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.11 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

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C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. "Recommended Nailing Schedule" of referenced framing standard and with AFPA's "National Design Specifications for Wood Construction."

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. The scope of blocking required is generally indicated in the drawings, but also includes blocking for the following installations and in the following locations:

1. Finish carpentry and Millwork including office shelves and casework.
2. Roofing and Flashing.
3. Roof Accessories.

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4. Casework and attached furnishings.
5. Electrical such as mounting boards for telephone, fire alarm and electrical panels.
6. Exterior rough blocking. Materials should be pressure treated.

3.3 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 FLOOR JOIST FRAMING INSTALLATION

A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

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I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal-size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.5 JOIST FRAMING INSTALLATION

A. Joists: Install joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

END OF SECTION

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SECTION 062013 - EXTERIOR CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work under this Section consists of furnishing and installing all finish carpentry and related work as shown on the drawings and as specified herein, and includes, but is not limited to the following:

1. Trim, fascias and aprons.
2. Standing and running trim.
3. Soffits.
4. All other items required to complete the exterior finish carpentry work.

B. Related Sections include the following:

1. Section 061000 - “Rough Carpentry” for rough carpentry, blocking, furring and grounds.
2. Section 076200 - “Sheetmetal Flashing, Roofing and Trim” for flashing.
3. Division 9 Section “Painting” for face and back painting of wood carpentry and trim.

1.3 QUALITY ASSURANCE

A. Arrange for installation of finish carpentry by craftsmen experienced in fine woodworking. Finish carpenters should have a minimum of ten years experience in successfully completing projects of similar complexity and equally high standards of detail and workmanship.

B. AWI Quality Standard: Comply with applicable requirements in AWI's "Architectural Woodwork Quality Standards" for construction, finishes, grades of wood windows, and other requirements.

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1.4 SUBMITTALS

A. Product Data

1. Submit product data on each material including lumber, finish carpentry materials, fasteners and other items to be used in the work.

B. Shop Drawings

1. Submit shop drawings for each type of wood trim and each type of custom molded shape to be used in the work.
2. Shop drawings shall be full-size profiles with dimensions.

C. Submit samples of the following:

1. Each type of wood trim. Provide two 12” lengths of each custom molded shape required for the project.

D. Delegated-Design Submittal: For exterior canopy brackets, including analysis indicating load capacity. Comply with IBC loading requirements.

1.5 PRODUCT DELIVERY, STORAGE & HANDLING

A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

C. Store wood products flat and keep dry prior to installation. Installing siding wet or saturated may result in shrinkage at butt joints. Carry panels on edge.

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1.6 PAINTING

A. All painting is specified under Section 099123 - “Painting,” but it shall be the Contractor's responsibility to see to it that all surfaces of exterior wood siding, trim, soffits, fascia, and any other wood finishes used on the exterior of the building and which are concealed after installation, are backprimed prior to installation.

1.7 GUARANTEE

A. Guarantee all the work of this Section for a minimum of one year after the date of Substantial Completion against any defect in materials or workmanship.

PART 2 - PRODUCTS

2.1 WOOD PRODUCT QUALITY STANDARDS

A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

B. Plywood Standard: Comply with PS 1/ANSI A199.I.

C. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.

D. Hardwood Plywood Standard: Comply with PS 51.

E. Woodworking Standard: Where indicated for a specified product comply with specified provision of the following:

1. Architectural Woodwork Institute (AWI) "Quality Standards."

2.2 MATERIALS

A. General

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual

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sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.

2. Moisture Content of Softwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
3. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation within the ranges required in the referenced woodworking standard.
4. Lumber for Painted Finish: Use pieces made of solid lumber stock only. Do not use glued-up lumber.

B. Exterior Finish Materials

1. Wood standing and running trim, molding, watertables, cornices, fascia and related items of exterior trim for paint finish: Provide Honduras Mahogany.
2. Plywood for Paint Finish:

a. Provide APA Medium Density Overlay (MDO) plywood panels, with Exposure Durability Classification Exterior and 3/4" thickness, unless specified or indicated otherwise.

C. Miscellaneous Materials

1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications. Fasteners for exterior work shall be stainless steel or hot-dipped galvanized steel.

2.3 MATCHING MOLDINGS

A. General: In general, match existing profiles, thicknesses and sizes to like elements of existing building. Ease edges of new members as necessary to match existing members.

2.4 WOOD TREATMENT

A. Preservative Treatment

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1. All lumber materials used in contact with concrete and masonry foundations, and not shown to be "fire-retardant treated" or "treated," on the Drawings shall be treated with waterborne preservatives, and meet the requirements of American Wood Preservers Association (AWPA) Standards.
2. Water-Repellent Preservative Treatment by Nonpressure Process: AWPA N1 (dip, spray, flood, or vacuum-pressure treatment). Provide material compatible with painting requirements.
3. Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
4. Basis-of-Design: Subject to compliance with requirements, provide Nisus Corporation; BORA-CARE® Commercial Termiticide, Insecticide and Fungicide.
5. Active Ingredient: 40% Disodium Octaborate Tetrahydrate (DOT)
6. Penetrant: Patented Glycol mixture.
7. After treatment, kiln dry lumber and plywood to a maximum moisture content respectively of 19% and 15%. Mark each treated piece with AWPA Quality Mark.
8. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition replacement wood members and replacement wood members to prevailing conditions at installation areas before installing.

B. Prime and fully paint all backs, ends, cuts and concealed surfaces.

3.2 INSPECTION

A. Inspect the substrates to receive work of this Section and conditions under which the work has to be performed. Report in writing to the Contractor, with copy to the Contracting Officer, any conditions which might adversely affect the installation. Do not proceed with the installation until defects have been corrected and conditions are satisfactory.

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3.3 INSTALLATION

A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level; and with no offset in flush adjoining surfaces; and with 1/32" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.

E. Fasteners

1. Finish screws shall be set just below the surface and caulked.
2. Only nail guns that drive a full head nail can be used. Nails used in nail guns must be hot dipped galvanized 6d. common nail as specified for hand nailing. Nail guns must have a flush mount attachment to avoid overdriving the nail head. If a hot dipped galvanized nail of the specified size and type cannot be driven in available nail guns, or if the driving of the nails cannot be controlled to avoid over or under driving, nail guns shall not be used.
3. Leave 1/8” space around all wood trim to allow for expansion of wood trim. Caulk the 1/8” space.

3.4 ADJUSTMENT, CLEANING, FINISHING, & PROTECTION

A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

B. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintain conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

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END OF SECTION

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SECTION 064400 - ORNAMENTAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Interior frames and jambs where so indicated on the drawings.
2. Restoration or revisions to historic woodwork where so indicated.
3. Interior ornamental work where so indicated.
4. Plastic laminate clad casework where so indicated.

B. Related Sections include the following:

1. Section 055000 - “Metal Fabrications,” for metal supports and reinforcement associated with interior architectural woodwork.
2. Section 061000 - "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.04 STANDARDS

A. Millwork: No unfinished millwork, plywood/particle board or wood framing (including backs, undersides, and all surfaces concealed from view) will be permitted. All unfinished surfaces or

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openings cut through finished surfaces are to be sealed to be water resistant; blend with specified finish materials.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories handrail brackets and finishing materials and processes.

B. Product Data: For panel products, cabinet hardware and accessories, handrail brackets and finishing materials and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in architectural woodwork.

D. Product Certificates: For each type of product, signed by product manufacturer.

E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

F. Qualification Data: For installer and fabricator.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for Custom Grade of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

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1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.09 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 8 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

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PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species for Opaque Finish on Exposed and Semi-Exposed Surfaces: Certified wood complying with forest certification requirements. Closed-grain hardwood.

C. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50% percent.
2. Hardboard: AHA A135.4.
3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde. SierraPine's "Medex," "Medex NC," and "Medite II" and Weyerhaeuser's "Premier Plus" fiberboard are made without urea formaldehyde.
4. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

D. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick, unless otherwise indicated.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abet Laminati, Inc.
b. Formica Corporation.
c. Lamin-Art, Inc.
d. Panolam Industries International, Inc.
e. Wilsonart International; Div. of Premark International, Inc.

F. Laminate Cladding for Exposed Surfaces:

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1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: Grade HGS.

    a. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Contracting Officer from laminate manufacturer's full range in the following categories: Solid colors, matte finish.

2.02 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:

1. Semi-concealed Hinges for Flush Doors: BHMA A156.9, B01361.
2. Semi-concealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Back-Mounted Pulls: BHMA A156.9, B02011, and B02131. Style of pulls as indicated.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Drawer Slides: BHMA A156.9, B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.

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3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.

F. Door Locks: BHMA A156.11, E07121.

G. Drawer Locks: BHMA A156.11, E07041.

H. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Match existing.

J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.03 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

C. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

2.04 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

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B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Contracting Officer seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

F. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.05 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

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C. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 WOODWORK INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

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1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
2. Install wall railings on indicated metal brackets securely fastened to wall framing.
3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

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SECTION 070150.19 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.02 SUMMARY

1. Base Bid assumes replacement of existing membrane roof, sheathing and insulation replacement. Apply the requirements of this section as appropriate to the scope of roofing work.

2. Section Includes:

    1. Full tear-off of roof areas if so indicated.
    2. Re-cover preparation of roof areas indicated.
    3. Removal of flashings.
    4. Temporary roofing.

1.03 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. Related Sections include the following:

    1. Section 012300 – “Alternates” for an alternate affecting the work of this section.

1.04 DEFINITIONS

1. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
2. Full Roof Tear-Off: Removal of existing roofing system from sheathing.

1.05 ACTION SUBMITTALS

1. Product Data: For each type of product.
2. Shop Drawings: Include plans, sections, and details.

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1.06 INFORMATIONAL SUBMITTALS

1. Qualification Data: For Installer. Include certificate that Installer is licensed to perform asbestos abatement.
2. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.
3. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.07 QUALITY ASSURANCE

1. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
2. Reroofing Conference: Conduct conference at Project site.

   Meet with Government; Contracting Officer; Government's insurer if applicable; roofing Installer, including project manager, superintendent, and foreman.
   Review methods and procedures related to roofing system tear-off and replacement, including, but not limited to, the following:

   a. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
   b. Existing roof sheathing conditions requiring notification of Contracting Officer.
   c. Condition and acceptance of existing roof sheathing substrate for reuse.
   d. Structural loading limitations of roof sheathing during reroofing.
   e. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
   f. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
   g. Asbestos removal and discovery of asbestos-containing materials.
   h. Governing regulations and requirements for insurance and certificates if applicable.
   i. Existing conditions that may require notification of Contracting Officer before proceeding.

1.08 FIELD CONDITIONS

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1. Government may occupy portions of building below reroofing area. Conduct reroofing so Government's operations are not disrupted. Provide Government with not less than 72 hours' notice of activities that may affect Government's operations.

   Coordinate work activities daily with Government so Government can place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
   Before working over structurally impaired areas of sheathing, notify Government to evacuate occupants from below affected area. Verify that occupants below work area have been evacuated before proceeding with work over impaired sheathing area.

2. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
3. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
4. Conditions existing at time of inspection for bidding are maintained by Government as far as practical.
5. Limit construction loads on roof.
6. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building. Remove only as much roofing in one day as can be made watertight in the same day.
7. Hazardous Materials: If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Contracting Officer and Government. Hazardous materials - will be removed by Government under a separate

PART 2 - PRODUCTS

2.01 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

PART 3 - EXECUTION

3.01 PREPARATION

A. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

B. Maintain systems to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof gutters and leaders.

3.02 ROOF TEAR-OFF

A. General: Notify Government each day of extent of roof tear-off proposed for that day.

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B. Full Roof Tear-Off: Where indicated, remove existing roofing and other roofing system components down to the sheathing.

3.03 SHEATHING PREPARATION

A. Inspect sheathing after tear-off of roofing system.

B. If sheathing surface is unsuitable for receiving new roofing or if structural integrity of sheathing is suspect, immediately notify Contracting Officer. Do not proceed with installation until directed by Contracting Officer.

C. Replace roof sheathing as directed by Contracting Officer.

3.04 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Government's property.

END OF SECTION

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SECTION 075423 - EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Adhered membrane roofing system.
2. Vapor retarder.
3. Roof insulation.

B. Related Sections include the following:

1. Division 1 Section “Alternates” for alternate affecting the work of this section.
2. Division 6 Section "Rough Carpentry" for roof deck, wood nailers, curbs, and blocking.
3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counter-flashings.
4. Division 7 Section "Joint Sealants."

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

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C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-120.
2. Hail Resistance: MH.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Insulation fastening patterns.

C. Samples for Verification: For the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-inch length of metal termination bars.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

G. Maintenance Data: For roofing system to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

I. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

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1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.

C. Source Limitations: Obtain components for membrane roofing system from same manufacturer as roofing membrane.

D. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Government; Contracting Officer; Government's insurer if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

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1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace any components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing accessories, roof insulation, fasteners, vapor retarder, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type I, reinforced, uniform, flexible sheet made from EPDM, and as follows:

1. Available Manufacturers:

a. Carlisle SynTec Incorporated.
b. Celotex Corporation.
c. Firestone Building Products Company.
d. Johns Manville International, Inc.

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e. Versico Inc.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Black.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Cold Fluid-Applied Membrane Adhesive: Manufacturer's standard cold fluid-applied bonding adhesive formulated to adhere fleece-backed roofing membrane to substrate.

E. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film, and manufacturer’s standard 5-inch cover tape.

F. Lap Sealant: Manufacturer's standard single-component sealant, color to match roofing membrane.

G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

H. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

I. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

J. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

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2.3 VAPOR RETARDER

A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.

1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.4 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated. Maximum single board thickness shall be 2 inches.

1. Insulation thickness shall be 6”, except where a thinner layer is required at drain sumps. R-Value for roof assembly shall be no less than 40.
2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes if indicated.

B. Compressible strength shall be 25 psi average; label materials to demonstrate compliance.

C. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.

D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 VAPOR-RETARDER INSTALLATION

A. Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

1. Area to receive vapor retarder: Membrane roof areas directly above occupied spaces shall receive vapor retarder, and areas within one foot of these areas.
2. Seal side and end laps with tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

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3.4 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck.

3.5 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

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D. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

F. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

3.7 FIELD QUALITY CONTROL

A. University will have a full-time inspector at the project during installation of roofing.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Contracting Officer.

1. Notify Contracting Officer or Government 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

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D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Contracting Officer and Government.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION

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SECTION 076200 - SHEET METAL FLASHING, ROOFING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Sheet metal flashing and trim at roof edges, copings, masonry and other locations where flashing is necessary to create leak free exterior assemblies.
2. Sheet metal roofing at canopy.

B. Related Sections:

1. Section 013591 - "Historic Preservation Treatment Procedures" for renovation and protection requirements.
2. Section 017310 - “Cutting and Patching” for cutting and restoration work.
3. Section 040322 – “Brick Masonry Repair and Construction.”
4. Section 061000 - "Rough Carpentry" for plywood sheathing and wood nailers, curbs, and blocking.
5. Section 075423 - “EPDM Membrane Roofing” for materials and installation of sheet metal flashing and trim integral with roofing.

1.03 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

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1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
8. Details of connections to adjoining work.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.06 SEPARATION OF METALS

A. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of aluminum with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

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1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.

2.03 SHEET METAL UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Source Limitations: Obtain underlayment from single source from single manufacturer.
2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

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2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.05 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, at shelf angles, and elsewhere indicated. Shop fabricate interior and exterior corners. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch, end dams.

D. Fabricate from the following materials:

1. Fabricate or repair copperwork in type and weight of material matching adjoining existing exposed copperwork.

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PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 EXISTING SHEET METAL – GENERAL RESTORATION

A. Provide the following work at all existing flashing within the limits of work:

1. Repair or replace existing flashings showing damage, even if not specifically indicated as such. Connect new flashings to existing flashings in order to create waterproof, sound and workmanlike installations.

3.03 INSTALLATION OF SHEET METAL UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, under sheet metal flashing and trim.

1. Locations:

a. At vertical applications, over plywood sheathing, behind sheet metal and slip sheet.
b. Over self-adhering, high-temperature sheet underlayment.

2. Install in shingle fashion to shed water.
3. Lap joints not less than 4 inches.

B. Self-Adhering, High-Temperature Sheet Underlayment:

1. Locations:

a. Under all sheet metal roofing, copings and roof flashing.

2. Install self-adhering, high-temperature sheet underlayment; wrinkle free.

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3. Prime substrate if recommended by underlayment manufacturer.
4. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
5. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
6. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
7. Roll laps and edges with roller.
8. Cover underlayment within 14 days.

C. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing, roofing and trim.

1. Locations:

a. Over felt underlayment, to prevent metal roofing and flashing from adhering to felt.

2. Install in shingle fashion to shed water.
3. Lap joints not less than 4 inches.

3.04 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Turn tops of flashing pan sides into masonry joints and repoint joint.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

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C. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.05 METAL ROOFING FABRICATION

A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation. Fabricate sheet metal roofing and accessories in shop to greatest extent possible.

1. Flat-Seam Roofing: Form flat-seam panels from metal sheets. Solder all seams.

B. Fabrication Tolerances: Fabricate sheet metal that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

C. Form exposed sheet metal work to fit substrates with little oil canning; free of buckling and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

1. Lay out sheet metal roofing so transverse seams, if required, are made in direction of flow with higher panels overlapping lower panels.
2. Offset transverse seams from each other 12 inches minimum.
3. Fold and cleat eaves and transverse seams in shop.
4. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements indicated on Drawings and as required for leakproof construction.

3.06 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

END OF SECTION

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Silicone joint sealant as indicated or specified adjoining renovated construction.

1.03 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.04 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

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PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Contracting Officer from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT. Color selected from the manufacturer’s full range.

1. Products: Basis of Design Sika Sikasil WS-295 or like product by one of the following:

a. Dow Corning Corporation.
b. Tremco Incorporated.
c. Pecora Corporation.

2.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

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2.04 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

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a. Metal.
b. Glass.
c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.02 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.

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3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.03 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints in new or modified horizontal traffic or walking surfaces. Sealant joints in unmodified exterior construction is NIC.

1. Joint Locations:

a. Joints in concrete and paving units of masonry, including steps.
b. Other joints as indicated.

2. Silicone Joint Sealant: Pourable, traffic grade, neutral curing.
3. Joint-Sealant Color: As selected by Contracting Officer from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces adjoining new or modified areas of exterior construction. Sealant joints in unmodified exterior construction is NIC.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Indicated joints in stone cladding.
d. Joints between different materials listed above.
e. Perimeter joints between materials listed above and frames of doors windows and louvers.
f. Other joints as indicated.

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2. Silicone Joint Sealant: Nonsag, neutral curing.
3. Joint-Sealant Color: Custom color. Provide three different colors for different substrates.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of openings where indicated.
c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
e. Other joints as indicated.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Contracting Officer from manufacturer's full range of colors. Up to three colors may be required.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Contracting Officer from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.
b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Contracting Officer from manufacturer's full range.

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3.04 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

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SECTION 081433 - STILE AND RAIL WOOD DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior stile and rail wood doors and frames.
2. Fitting stile and rail wood doors to frames and machining for hardware.
3. Commercial door hardware for stile and rail wood doors and frames.

B. Related Sections:

1. Section 099123 - “Painting” for finishing stile and rail doors and frames.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include details of construction and glazing.

B. Shop Drawings: For stile and rail wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:

1. Dimensions of doors.
2. Locations and dimensions of mortises and holes for hardware.
3. Door Hardware Sets: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as procedures and diagrams.

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Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

C. Samples for Verification: Corner sections of doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions and requirements of quality standard referenced in Part 2.

B. Package doors individually in opaque plastic bags or cardboard cartons.

C. Mark each door on top and bottom edge with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use only materials that comply with referenced standards and other requirements specified.

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1. Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
2. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea-formaldehyde resins.

B. Panel Products: As indicated:

1. Veneer core plywood, made with adhesive containing no urea-formaldehyde resin.

2.2 STILE AND RAIL WOOD DOORS

A. Stile and Rail Wood Doors: Custom doors complying with AWI's "Architectural Woodwork Quality Standards," and with other requirements specified.

1. Grade: Custom.

B. Design as follows:

1. Style: Match existing style.
2. Wood Species for Opaque Finish at Exterior Doors: African Mahogany (Khaya invorensis) or Spanish Cedar (Cedrela odorata).
3. Grades: Select, clear. Finger jointing not allowed. Surfaced (smooth) S4S.
4. Stile and Rail Construction: Clear lumber; may be edge glued for width.
5. Flat Panel Construction: MDO, resin impregnated fiber over wood-based panel product.
6. Panel Designs: Match existing.
7. Stile and Rail Widths: Match existing.
8. Molding Profile: Match existing.

2.3 STILE AND RAIL WOOD DOOR FABRICATION

A. Fabricate stile and rail wood doors in sizes indicated for field fitting.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W Series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

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C. Glazed Openings: Trim openings indicated for glazing with solid wood moldings, with one side removable. Miter wood moldings at corner joints.
D. Glass: Clear laminated safety glass, 1/4".
E. Exterior Doors: Factory treat exterior doors after fabrication with water-repellent preservative.

2.4 BUTT HINGES

A. Butts and Hinges: Listed under Category A in BHMA's "Certified Product Directory."

B. Template Hinge Dimensions: BHMA A156.7.

C. Manufacturer's Product: Hager Heavy Duty, ABB850.

D. Available Manufacturers:

1. Rixson.
2. Hager Companies.
3. Stanley Commercial Hardware; Div. of The Stanley Works.

2.5 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", and FED-STD-795, "Uniform Federal Accessibility Standards."

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Latches and Locks for Means of Egress Doors: Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Manufacturer: Schlage.

D. Lock and Latch Trim: Match existing.

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E. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latch-bolt throw.
2. Deadbolts: Minimum 1-inch bolt throw.

F. Backset: 2-3/4 inches, unless otherwise indicated.

G. Strikes: Manufacturer's standard strike with strike box for each latch-bolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Auxiliary Deadlocks: BHMA A156.5.

2.6 MORTISE LOCKS AND LATCHES

A. Mortise lockset/latch-set:

1. Manufacturer: Schlage.
2. Grade: Heavy duty commercial, with interchangeable core.
3. Functions: As indicated in Schedule.

2.7 LOCK CYLINDERS

A. General: Integrate cylinders and keying into Government's existing system.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Seven.
2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
3. Manufacturer: Same manufacturer as for locks and latches. Do not substitute.

2.8 FRAME MOUNTED CLOSERS

A. General: Heavy-duty type, cast-iron body type. Provide 10-year warranty. Provide through-bolted units only. Closers shall not reduce headroom to less than 6’-6” clear.

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B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", FED-STD-795, "Uniform Federal Accessibility Standards."

C. Hold-open Feature: At non-fire-rated doors, provide closers with manufacturer's standard hold-open feature, activated by pushing the door leaf into a fully open position.

D. Opening: At openings where door swing is shows graphically on drawings to open 180 degrees, provide closer product that will allow this operation.

E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

F. Closers: BHMA A156.4, Grade 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Manufacturer: LCN
2. For Push Side Mounting: # 4110.
3. For Pull Side Mounting: # 4010
4. Finish: Architectural plated metal finish on metal cover and exposed metal elements, unless otherwise indicated. Painted finish will not be accepted.
5. Mount closers on non-public side of doors.

2.9 STOPS AND SILENCERS

A. Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch; fabricated for drilled-in application to frame.

B. Stops, General: Provide floor stops for doors unless wall or other type stops are scheduled or indicated. See also closers paragraphs for closer arm hold-open feature requirements. Do not install stops prior to review and approval of the Contracting Officer for stop locations.

2.10 DOOR GASKETING

A. Standard: BHMA A156.22.

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B. General: Provide continuous weather-strip gasketing on exterior doors. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
4. Thresholds: Provide metal hardware thresholds at exterior doors and gasketed openings except where thresholds are indicated to be wood, stone or other materials.

C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

E. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

2.11 THRESHOLDS

A. Standard: BHMA A156.21.

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and FED-STD-795, "Uniform Federal Accessibility Standards."

1. Bevel raised thresholds with a slope of not more than 1:2.

C. Thresholds for Means of Egress Doors: Maximum 1/2 inch high.

D. Manufacturer's Product:

1. Threshold: Pemko 1665 series, match full depth of door frame.

2.12 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Contracting Officer.

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1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.13 FINISHES

A. Finishes: Match existing finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors will be installed.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wood doors to comply with manufacturer's written instructions, AWI's "Architectural Woodwork Quality Standards," and other requirements specified.

B. Field-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

3.3 HARDWARE INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

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B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Operation: Rehang or replace doors that do not swing or operate freely.

C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

3.5 DOOR HARDWARE SET REQUIREMENTS

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following.

B. HS1: Exterior

1. Hinges

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2. Lever trim
3. Cylinder
4. Closer
5. Threshold
6. Head and jamb weatherstripping.
7. Sill weatherstripping.

END OF SECTION

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SECTION 099123 - PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Section includes surface preparation and the application of paint systems.

B. Limit of painting work:

1. Refer to architectural drawings, and these specifications. In general, finish surfaces as follows:

    a. Paint new materials indicated or specified to be painted and all materials where construction activities modify the appearance of existing surfaces.

2. Provide an even surface of uniform finish, color, texture, and appearance. Apply primer and intermediate paint coats over patched surfaces and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
3. Painted surfaces requiring retouching or patching may include the following materials:

    a. Concrete.
    b. Clay masonry.
    c. Concrete masonry units (CMU).
    d. Steel.
    e. Cast iron.
    f. Galvanized metal.
    g. Aluminum (not anodized or otherwise coated).
    h. Wood.
    i. Hollow metal.

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1.03 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to

ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

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1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage, dated with time of production, and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.06 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.08 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

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PART 2 - PRODUCTS

1.01 MANUFACTURERS

A. Where generic products are listed, provide materials by one of the following four manufacturers. Where individual manufactures or products are listed, provide material by the listed manufacturer or the specified product.

1. Sherman Williams
2. Benjamin Moore
3. Pratt & Lambert
4. ICI-Glidden

1.02 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
B. Colors:

1. As selected by Contracting Officer from manufacturer's full range.

C. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

D. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
6. Pretreatment Wash Primers: 420 g/L.

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1.03 PRIMERS/SEALERS WHERE INDICATED

A. Interior Latex Primer/Sealer: MPI #50.

B. Interior Alkyd Primer/Sealer: MPI #45.

1.04 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Quick-Drying Alkyd Metal Primer (**Interior**): MPI #76.

C. Rust-Inhibitive Primer (Water Based) (**Interior**): MPI #107.

D. Cementitious Galvanized-Metal Primer (**Interior**): MPI #26.

E. Quick-Drying Primer for Aluminum: MPI #95.

1.05 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

1.06 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).

B. Interior Latex (Satin): MPI #43 (Gloss Level 4).

C. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

D. High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).

1.07 ALKYD PAINTS

A. Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).

B. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

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C. Exterior Alkyd (Semigloss): MPI #94 (Gloss Level 5).

1.08 CLEANING MATERIALS FOR SUBSTRATES

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.

D. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

E. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "Naval Jelly," for removing corrosion from iron and steel.

1.09 PATCHING MATERIALS FOR EXISTING METAL SUBSTRATES

A. Metal Patching Compound: Two-part, polyester-resin metal patching compound; knife-grade formulation as recommended by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated due to corrosion. Filler shall be capable of filling deep holes and spreading to feather edge.

PART 3 - EXECUTION

1.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.

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3. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

1.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

1. SSPC-SP 3, "Power Tool Cleaning."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

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G. Newly galvanized metal is often oily, and sometimes galvanized metal has been dipped in a chromate bath immediately after galvanizing. Chromates can greatly interfere with paint adhesion and must be removed prior to painting. Test for chromate as described in ASTM B 201. Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Surface profiling by sweep blasting is an acceptable means of treatment. Take care to prevent blowing off the zinc entirely. Provide SSPC SP 7 blasting before prime coating. Wash with detergent solution, thoroughly rinse off debris and dry before primer application.

H. Black Iron Substrates: Remove oxides and oily residues, wipe clean and dry. Prime and paint as specified.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

1.03 PREPARATION OF EXISTING PREVIOUSLY PAINTED SUBSTRATES

A. General: Provide the following preparation work at existing substrates in addition to other preparation work indicated in this Part of this Section.

B. Lead paint: Prior to surface preparation, determine if existing coating contains lead. Contact the National Lead Information Center at 800-424-5323 for more information on proper handling. Follow requirements of State and local governing authorities.

C. Previously Painted Ferrous Metal Surfaces:

1. Where removal of existing metalwork is indicated, remove the metal to a shop for cleaning. Clean as required for Steel Structural Painting Council, SSPC-SP 6: Commercial Blast Cleaning. Shop finish metalwork. Reinstall with stainless steel fasteners after finishing.
2. Where removal of existing metalwork is not indicated, clean metal with a chisel-style scraper and power wire brushing. Clean as required for SSPC-SP-11: Power Tool Cleaning to Bare Metal. Use the scraper to take off heavy rust and loose paint, then follow up by power wire brushing or sanding with aluminum oxide paper of the surface to remove

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as much of the rust residue as possible. After cleaning scrub the surface with a detergent-and-water solution, followed by a thorough rinsing with clean water. Dry metal with rags and air-dry before application of metal primer.

D. Previously Painted Wood Surfaces:

1. For previously painted surfaces, remove surface grime by washing with detergent, TSP or sal soda solution. Rinse thoroughly with clean water until all residue is removed. Sand glossy surfaces to improve bond for new coats of paint. Scrap to remove loose paint and blisters. Sand smooth edges of chips and blisters. Test the first coat of paint by applying it in an inconspicuous area. Allow it to dry overnight. If the paint wrinkles or lifts, remove the existing coat. Apply primer according to the manufacturer's instructions.

a. At locations where existing paint contains lead, omit sanding.

1.04 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

1.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

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B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

1.06 EXTERIOR PAINTING SCHEDULE

A. Exterior Painting generally requires no less than one prime coat and two top coats.

B. New Exterior Galvanized Metal Substrates: Provide the following finish systems over new exterior zinc-coated metal surfaces:

1. Epoxy / Polyurethane System.
2. Satin Finish: Two finish coats over epoxy primer.

a. Epoxy Primer: Sherwin Williams B58B00600 - Macropoxy® 646 Fast Cure Epoxy.
b. Top Coats: Two finish coats Sherwin Williams B65T00204 - Corothane® II Low Voc Satin Polyurethane.

C. Existing Exposed Exterior Ferrous Metal Substrates: Provide the following finish systems over existing exterior ferrous metal substrates where the existing finish is deteriorated to any degree, including but not limited to ornamental metal, handrails, and other like surfaces except as indicated otherwise in this section:

1. Epoxy / Polyurethane System.
2. Satin Finish: Two finish coats over epoxy primer.

a. Epoxy Primer: Sherwin Williams B58B00600 - Macropoxy® 646 Fast Cure Epoxy.
b. Top Coats: Two coats of Sherwin Williams B65T00204 - Corothane® II Low Voc Satin Polyurethane.

D. Existing Fully Protected Exterior Ferrous Metal Substrates: Provide the following finish systems only over existing exterior protected ferrous metal substrates where existing paint is generally protected, and where paint is in sound condition, no rust is present and metal surface is not exposed.

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1. Alkyd System: EXT 5.1D

    a. Prime Coat: Alkyd primer over lightly sanded fully sound painted surface.
    b. Top Coats: Two finish coats of exterior alkyd.

E. Exterior Wood Substrates for Opaque Finish: Provide the following finish over new or previously painted opaque finished wood surfaces:

1. Alkyd System: EXT 6.3B

    a. Exterior Oil Wood Primer, MPI Product 7.
    b. Topcoats: Alkyd; semi-gloss, MPI Product 94. Exterior Wood Substrates for Opaque Finish: Provide the following finish systems over new or previously finished wood surfaces:

F. Portland Concrete Substrates: At existing concrete substrates that have been repaired or patched, repaint surfaces to match existing colors and textures. At new work, provide all coats. At existing sound painted surfaces, provide topcoats only.

1. Latex System:

    a. Prime Coat: Latex, exterior, matching topcoat.
    b. Intermediate Coat: Latex, exterior, matching topcoat.
    c. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.

END OF SECTION

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SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. The work shall include but not limited to the following: All existing roof drains shall be removed and replaced with new drains.

B. This Section includes general administrative and procedural requirements for the plumbing installations. The administrative and procedural requirements included in this section expand the requirements specified in Division 01.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this and the other sections of Division 22.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 22 - Plumbing

1.3 CODES, PERMITS AND INSPECTIONS

A. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over construction work at the project.

B. It shall be understood that the requirements of the specifications and drawings are complimentary to the requirements delineated elsewhere in the code or by the authorities exercising jurisdiction over the project. Nothing on the drawings and specifications shall be interpreted as reason to waive the applicable code requirements. Installed work identified as having code deficiencies shall be replaced at the contractor’s expense.

C. All required permits, approval and inspection certificates shall be obtained, paid for, and made available at the completion of the work, by the Plumbing Contractor.

D. Installation procedures, methods, and conditions shall comply with the latest requirements of The Federal Occupational Safety and Health Act (OSHA).

E. Prepare and submit to the building department a set of “as-built” record drawings for approval, in a form acceptable to the building department.

F. The Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction.

G. The Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction.

1.4 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks and defects. Any defective materials or workmanship, as well as damage to the work of all trades resulting from same, shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of plumbing equipment.

1.5 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. Piping: Pipe, fittings, flanges, valves, controls, hangers, drains, insulation, and items customarily required in connection with the transfer of fluids.

G. By Other Trades: By persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of this Trade. In the event that this document is used to acquire work as part of a general construction contract the words “by other trades” shall mean by persons or parties who are not anticipated to be the sub-contractor for this trade working together with the general contractor. In this context the words “by other trades” shall not be interpreted to mean not included in the overall contract.

H. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.6 SUBMITTALS

A. In accordance with Division 01, SUBMITTAL PROCEDURES, furnish the following:

B. Prior to purchasing any equipment or materials, a list of their manufacturers shall be submitted for approval.

C. Prior to assembling or installing the work, the following shall be submitted for approval:

1. Catalog/internet information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment.
2. Coordination drawings for access panels and door locations

D. Documents for equipment and materials will not be accepted for review unless:

1. They include complete information pertaining to appurtenances and accessories.
2. They are submitted as a package where they pertain to related items.
3. They are properly marked with service or function, project name, where they consist of catalog sheets displaying other items which are not applicable.
4. They indicate the project name and address along with the Contractor's name, address and phone number.
5. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

E. Shop Drawing Review

1. The purpose of the review of shop drawings is to maintain integrity of the design. Unless the contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, approval by the Contracting Officer does not constitute acceptance. It is not to be assumed that the Contracting Officer has read the text nor reviewed the technical data of a manufactured item and its components except where the Vendor has pointed out differences between his product and the specified model.
2. Upon receipt of the approved manufacturers and material suppliers list, the Contractor shall immediately obtain complete Shop Drawings, Product Data and Samples and equipment and material Specification Compliance Review documents from the manufacturers, suppliers, vendors and all Division 22 Contractors, for all materials and equipment as specified herein in various sections of the specifications and shall submit data and details of such materials and equipment for review by the. Prior to submission of the Shop Drawings, Product Data and Samples to the Contracting Officer, the Contractor shall thoroughly review the Shop Drawings, Product Data and Samples and certify they are in compliance with the Contract Documents. The Contractor shall provide a compliance review ("Compliance Review") of the applicable Drawings, Specifications and Addenda for the equipment and materials where specified in the individual Specification sections. Certain equipment must have a Compliance Review provided with the Contractor's proposal. Refer to each Specification section for proposal requirements. The Compliance Review will be a paragraph-by-paragraph review of the Specifications with the following information marked for each Specification section paragraph or in the margin of the original Specification and any subsequent Addenda.

    a. "C": Comply with no exceptions.
    b. "D": Comply with minor deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
    c. "E": Exception. Equipment, product or material does not comply. For each and every exception, provide a numbered footnote with reasons for each exception and suggest possible alternatives for the Government's consideration.
    d. "N/A": The specification paragraph does not apply to the proposed equipment, material or product.

e. Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Contractor is in complete compliance with the Contract Documents. Deviations or exceptions taken in cover letters, subsidiary documents, by omission or by contradiction does not relieve the Contractor from being in complete compliance unless the exception or deviation has been specifically noted (explicitly, not by implication) in the Compliance Review.

3. It is the responsibility of the contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by him with other trades. Approval of shop drawings containing omissions improper coordination does not relieve the contractor from making corrections at his expense.
4. Substitutions of equipment, systems, materials, must be coordinated by the Contractor with his own or other trades which may be involved with the item, such as, but not limited to, equipment substitutions which change electrical requirements, or hanging or support weights or dimensions.
5. Any extra charges or credits which may be generated by other trades due to substitutions will not be accepted unless the Contractor has an agreement in writing with the Owner.
6. Substitutions of equipment, systems, etc. requiring approval of local authorities must comply with such regulations and be filed at the expense of the Contractor (should filing be necessary). Substitutions are subject to approval or disapproval by the Contracting Officer. The Contractor in offering substitutions shall hold the Government and Contracting Officer harmless if the substituted item is an infringement of patent held by the specified item.
7. Any proposed substitution submitted for review, must be accompanied by additional documentation indicating all the differences between the specified materials or equipment and the proposed substitution. Substitutions submitted for review without supporting documentation will be returned as Incomplete – Resubmit.
8. Alternate materials or manufacturers of equipment will be considered only if the contractor submits detailed information and appropriate credit for the substitution at the time of bid opening. These detailed proposals, must include sufficient catalog information, including differences, efficiencies, dimensions, warranties and major component identification for proper evaluation of the alternate proposed. No alternate system by another manufacturer will considered prior to considering alternate equipment of the specified manufacturer.
9. Shop drawing review by the Contracting Officer, does not constitute reason to waive applicable code requirements. Work identified as having code deficiencies shall be replaced at the contractor's expense.

F. Explanation of Shop Drawing Stamp

1. Reviewed - No Exception Taken: indicates that we have not found any reason why this item should not be acceptable within the intent of the contract documents.
2. Exception Taken As Noted: indicates that we have found questionable components which if corrected or otherwise explained make the product acceptable.
3. Revised and Resubmit: indicates that this item should be resubmitted for review before further processing.
4. Resubmit Specified Item: indicates that the item will not meet the intent of the Contract.
5. Incomplete - Resubmit: Indicates that the submission is not complete and ready for review by the Architect or Engineer.
6. Verified for Electrical Services: Indicates that the electrical requirements has been confirmed with the electrical contract documents.
7. Architects Approval Required: Indicates that the submission will require the Architects review.
8. Structural Approval Required: Indicates that the submission will require the Structural Engineer's review.

9. Acoustical Consultant Review Required: Indicates that the submission will require the Acoustical Consultant's review
10. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for Construction, the Contractor scheduling his own work, or the Government.
11. The Contractor is responsible for having "Reviewed" copies of shop drawings bearing the "Reviewed - No Exception Taken" stamp of the Contracting Officer or Government's Consultant are kept on the job site and work is implemented in the field in accordance with these documents.
12. Where information from one Contractor is required by another contractor, it is the responsibility of the contractors to exchange information and coordinate their work.

1.7 MAINTENANCE DATA AND OPERATING INSTRUCTIONS

A. Maintenance and operating manuals in accordance with Division 01, for systems and equipment.

B. After all final tests and adjustments have been completed, fully instruct the proper Government's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Government's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.

C. Furnish required number of manuals, in bound form containing data covering capacities, maintenance of operation of all equipment and apparatus. Operating instruction shall cover all phases of control and include the following:

1. List of Spares: Recommended for normal service requirements.
2. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
3. Instruction Books may be standard booklets but shall be clearly marked to indicate applicable equipment.

1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Unit shall be stored and handled in accordance with manufacturer's instructions.

C. Unit shall be shipped with all listed items and control wiring factory installed unless noted on the submittals and approved prior to shipment.

D. Unit shall be shipped complete as specified. Parts for field installation shall not be shipped and stored on site without prior approval.

E. Unit shall be shipped with firmly attached labels that indicate name of manufacturer, model number, serial number, date of manufacturer, capacity information and plan tagging.

F. Deliver, store and handle all materials to keep clean and protected from damage.

G. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

H. Protect flanges, fittings, and piping specialties from moisture and dirt.

I. Protect equipment and other materials from damage after installed from construction debris and other damage.

J. This trade shall be responsible for its work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

K. This trade shall protect work and material of other trades from damage that might be caused by its work or workmen and make good damage thus caused.

1.9 PRE-CONSTRUCTION CONFERENCE PRIOR TO START OF WORK

A. Prior to commencing any Work, the Construction Manager, together with designated major Contractors, shall confer with the Contracting Officer concerning the Work under the Construction Contract.

B. The pre-construction conference will be conducted under the leadership of the CM and will occur soon after the CM notifies the Subcontractors of contract award. The pre-construction conference will focus on items such as the expedited submittal review procedure, interface and coordination between Contractor work scope, the CM's project site rules and requirements, temporary utility requirements, CM's construction schedule, etc.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate plumbing equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for plumbing installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work.

E. Coordinate connection of plumbing systems with existing services. Comply with requirements of governing regulations.

1.11 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

1.12 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

A. As used in the drawings and specifications, certain non-technical words shall be understood to have specific meanings as follows:

1. "Furnish"----------Purchase and deliver to the project site complete with every necessary appurtenance and support.
2. "Install"----------Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
3. “Provide"----------"Furnish" and "Install".

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether this instruction is explicitly stated as part of the indication or description.

C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.

D. No exclusions from, or limitations, in the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.

E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.

F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

I. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

J. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by Bulletin is subject to the base building specifications in all respects.

1.13 SEPARATION OF WORK BETWEEN TRADES

A. The Specifications for the overall construction delineate various items of work under separate trade headings. The list below sets forth this delineation to the extent that it affects the Plumbing Work.

B. In the absence of more detailed information, this list shall be taken as a specific instruction to the Plumbing trade to include the work assigned to it.

C. Indications that the Plumbing trade is to perform an item of work mean that it is to perform the work for its own accommodation only, except as specifically noted otherwise.

D. Oth = Divisions other than Electrical (Division 26); Mechanical (Divisions 21, 22 & 23)
Plb = Plumbing
FP = Fire Protection
Htg = Heating, Ventilating & Air Conditioning
Elec = Electrical
f = Furnished
I = Installed
p = Provided (furnished and installed)

Item	**Oth**	**Plb**	**Fp**	**Htg**	**Elec**	**Notes**
Temporary heat	p					
Temporary water	p					
Temporary light & power	p					
Temporary toilets	p					
Cutting, chasing & patching	p					Cost where due to late installation or improper coordination of work is the responsibility of the delinquent trade.
Sleeves through membraned and waterproofed slabs, decks and walls		p				For piping penetrating foundation walls and footings, the sleeve shall be 2 sizes greater than the penetrating pipe.
Waterproof sealing of pipes passing through sleeves		p				
Waterproof sealing of sleeves through membraned and water proofed slabs, decks and walls		p				
Fireproof sealing of excess openings in slabs, decks & fire rated walls		p				
Fastenings		p				
Supports		p				
Base flashing for roof drains and all piping penetrating roof	p					
Field touch up painting of damaged shop coats		p				

Item	Oth	Plb	Fp	Htg	Elec	Notes
Prime coating hangers & supports		p				
Rubbish removal		p				Where one trade furnishes and another installs, the installing trade removes the shipping and packing materials which accumulate.

E. The Plumbing Contractor is required to supply all necessary supervision and coordination information to any other trades who are to supply work to accommodate the Plumbing installation.

1.14 APPLICABLE PUBLICATIONS

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

Reference	Definition
ASTM	American Society for Testing Materials
ASPE	American Society of Plumbing Engineers
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
NEMA	National Electrical Manufacturers Assn.
[FM]	[Factory Mutual]
USAS	United States of America Standards Institute
ANSI	American National Standards Institute
[AWWA]	[American Water Works Association]
[F.S.]	[Federal Specifications, US Government]
I.S.O.	Insurance Services Organization
C.S.	Commercial Standards issued by the United States Department of Commerce.
M.S.S.	Manufacturers Standardization Society of the Valve and Fittings Industry
A.G.A.	American Gas Association, Inc.

Reference	Definition
A.S.H.R.A.E.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
P.D.I.	Plumbing and Drainage Institute
N.S.F.	National Sanitation Foundation
A.S.S.E.	American Society of Sanitary Engineering
I.A.P.M.O.	International Association of Plumbing and Mechanical Officials
C.I.S.P.I.	Cast Iron Soil Pipe Institute
DEP	Department of Environmental Protection

1.15 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks or defects. Any defective materials or workmanship as well as damage to the work of all trades resulting from same shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of Plumbing equipment.

1.16 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

A. Before submitting prices or beginning work, thoroughly examine the site and the Contract Documents.

B. No claim for extra compensation will be recognized if difficulties are encountered which examination of site conditions and Contract Documents prior to executing Contract would have revealed.

1.17 WORKMANSHIP

A. The entire work provide in this Specification shall be constructed and finished in every aspect in a workmanlike and substantial manner.

B. It is not intended that the Drawings shall show every pipe, fitting and appliance. Plumbing Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice.

C. Keep other trades fully informed as to shape, size and position of all openings required for apparatus and give full information to the General Contractor and other trades in a timely manner so that all opening may be built in advance. Furnish and install all sleeves, supports and the like as specified or as required.

D. In case of failure on the part of the Plumbing Contractor to give proper and timely information as required above, he shall do his own cutting and patching or have same done by the General Contractor, but in any case, without extra expense to the Government.

E. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the General Contractor and other trades which may be necessary to facilitate work and completion of the whole project.

1.18 CONTINUITY OF SERVICES

A. Do not interrupt existing services without Government's Representative approval.

B. Schedule interruptions in advance, according to Government's Representative instructions. Submit, in writing, with request for interruption, methods proposed to minimize impact on Government's operations.

C. Interruptions shall be scheduled at such times of day and work to minimize impact on Government's operations.

D. Products Criteria

1. All equipment furnished as part of the work shall comply with the latest editions of all applicable state and municipal energy codes. Provide certification from the equipment suppliers for all energy-consuming equipment that the equipment fully complies with these codes. Equipment submissions will not be accepted for review unless accompanied by such certification in writing.
2. All equipment and materials shall be new and without blemish or defect.
3. New equipment and materials shall be Underwriters Laboratories, Inc. (U.L.) labeled and/or listed where specifically called for or where normally subject to such U.L. labeling and/or listing services.
4. Asbestos: All equipment and materials shall be free of asbestos.
5. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" or "equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.
6. All equipment of one type such as drains, shall be the products of one Manufacturer.
7. Substituted equipment or optional equipment where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the Contractor's expense. Any modifications of related systems as a result of substitutions shall be made at the Contractor's expense.
8. Note that the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Contracting Officer, or any other Government Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the ability of the material or equipment involved or the mechanical performance of equipment. Approval of Shop Drawings does not invalidate the plans and specifications if in conflict, unless a letter requesting such change is submitted and approved on the Contracting Officer's letterhead.

9. Substitutions of equipment for that shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular cataloged item shown in the current catalog of the manufacturer.
10. Prohibition of Lead

    a. The presence and use of lead is strictly prohibited.
    b. The design and manufacture of all materials and equipment (piping, fittings, joints, connections, solders, accessories, etc.) provided, shall not contain lead in any form.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to allow right of way for piping installed at required slope.

3.2 PAINTING

A. Refer to Division 09 titled Finishes for painting requirements

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Provide prime coat painting for the following if not provided with factory applied corrosion protection.

1. Miscellaneous steel and iron provided by Contractor responsible for the work of Division 22.
2. Hangers and supports iron provided by Contractor responsible for the work of Division 22.
3. Miscellaneous steel and iron provided by Contractor responsible for the work of Division 22 installed outdoors shall be provided with finished coats of exterior paint in accordance with requirements of Division 09 titled “Finishes” in addition to prime coat.

3.3 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01; Section titled “Execution” covering “cutting and patching.” In addition to the requirements of Division 01 of this Specification, the following requirements shall apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed Work.
2. Remove and replace defective Work.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Install equipment and materials in existing structures.

C. Cut, remove and legally dispose of selected components, and materials as indicated.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

F. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

1. Refer to Division 01 Section titled “References” for definition of "experienced Installer."

G. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

1. Refer to Division 01 Section titled “References” for definition of "experienced Installer”.

3.4 TESTS

A. Testing of Systems

1. Perform all required tests in the manner prescribed by and to the satisfaction of the local building department, local plumbing inspector, and all authorities having jurisdiction.
2. Provide and pay for all devices, materials, supplies, labor and power required in connection with all tests. All tests shall be made in the presence and to the satisfaction of the inspectors having jurisdiction.
3. Defects disclosed by the tests shall be repaired, or if required by the Contracting Officer, defective work shall be replaced with new work without extra charge to the Government. Tests shall be repeated as directed, until all work is proven satisfactory.
4. This Contractor shall also be responsible for the work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his own work, and he shall, without extra charge to the Government, restore to its original condition, work of the trades so damaged and disturbed, engaging the original Contractors to do the work of restoration.

3.5 PLUMBING DEMOLITION

A. Comply with requirements of Division 02 titled “Existing Conditions”

B. This contractor shall provide all required labor, materials, equipment and perform all operations for complete demolition, removal and relocation of the existing work as indicated on the drawings and/or as specified or described and/or as required for the performance of the general work under this contract.

C. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Roof drains to Be Removed: Remove existing roof drain and portion of piping indicated to be removed to allow for installation of new roof drain.

D. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

E. All removed equipment and material shall be removed from the project site.

F. Provide alteration work as shown on drawings or described herein. If asbestos is present or suspected to be present inform the Government in writing so that such removal can be carried out by qualified personnel hired by the Government. Do not commence demolition until such work has been completed.

3.6 PROTECTION AND CLEANING

A. Cleaning of Piping System (General)

1. During construction, properly cap, plug and cover all openings in pipe lines and equipment so as to prevent the entrance of sand, dirt, and foreign matter. Each system of piping shall be flushed (for the purpose of removing grit, dirt, sand, and foreign matter from the piping), for as long a time as is required to thoroughly clean the systems.

3.7 SITE VISITATION SURVEYS AND MEASUREMENTS

A. All existing conditions cannot be completely detailed on the drawings. These include, but are not limited to piping, equipment, etc. This contractor shall survey the site and include all required costs in making up their bid proposal.

B. The contractor shall visit the premises to determine existing conditions and compare same with drawings and specifications and satisfy himself of all conditions prior to the submission of a bid proposal. No allowance will be made for failure to comply with these requirements and a bid proposal shall be construed as evidence he has done so.

C. Before submitting bid, visit the project site to satisfy yourself that all equipment shown or specified in the project contract documents can be installed generally as shown. Advise Owner prior to bid date, of any space or other installation problems.

D. Before submitting bid, become thoroughly familiar with all conditions under which work will be installed, as you will be held responsible for any assumptions, any omissions or errors made as a result of failure to become familiar with the site and Contract Documents.

E. Submission of a bid shall be construed as evidence, that a careful examination of the portions of the existing building, equipment, etc., which affect this work and the access to such spaces has been made and that the Contractor is familiar with existing conditions and difficulties that will affect the execution of the work. Claims will not be allowed for labor, equipment or materials required because of difficulties encountered, which could have been foreseen during such an examination.

3.8 CONNECTIONS TO EXISTING WORK (AND ALTERATIONS)

A. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing facilities. Submit to the Government for approval, date schedule of necessary temporary shut-downs of existing services. All shutdowns shall be made at such times as will not interfere with regular operation of existing facilities and only after written approval of the Government. To insure continuous operation, make necessary temporary connections between new and existing work. All costs resulting from temporary shut-downs shall be borne by this Contractor.

B. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.

C. The drawings of necessity utilize symbols and schematic diagrams to indicate connections to existing work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations.

D. The contractor shall coordinate all connections to existing work with the facility engineer. Contractor shall field verify exact location of all existing services.

E. Alteration

1. Provide alteration work for work as shown on drawings or described herein. If asbestos insulation is present or suspected to be present, inform the Government in writing so that such removal can be carried out by qualified personnel hired by the Government. Do not commence demolition until such work has been completed.
2. See Architectural Drawings for identification of equipment and fixtures that will be removed.
3. The existing systems shall be left in perfect working order upon completion of all new work.
4. Removed existing piping, fixtures, etc., shall not be reused unless otherwise indicated.
5. All existing exposed, unnecessary piping related to work being removed shall be completely removed.
6. Any expense required for shutdowns performed by the municipality shall be paid for by the Contractor.

END OF SECTION

SECTION 220719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Roof drains, and horizontal storm water piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

D. Qualification Data: Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.Applicator: Company specializing in insulation application with seven years. Covering applied by plumbing helper will not be acceptable minimum experience.Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, NFPA 255 or UL 723 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Accessories such as adhesives, mastics, cements, and tapes for fittings shall have the same component rating as listed above. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facings to impart flame and smoke-safety shall be permanent. The use of watersoluble treatments is prohibited.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," All insulation materials and the insulation thickness must comply with the applicable Energy Codes.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pittsburgh Corning Corporation; Foamglas.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

E. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000-Degree Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers" including 2004 Addenda.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
b. Eagle Bridges - Marathon Industries; 501.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
d. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
b. Eagle Bridges - Marathon Industries; 570.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
    b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
    c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in, in a Leno weave, for pipe.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, [1/2 inch.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, [1/2 inch.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: [0.062-inch soft-annealed, stainless steel].

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. C & F Wire.

2.13 PROTECTIVE SHIELDING GUARDS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.7 INDOOR PIPING INSULATION SCHEDULE

A. Stormwater Piping:

1. All Pipe Sizes: Insulation shall be one of the following with factory applied vapor barrier jacket:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following (with factory applied vapor barrier jacket):

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch.

END OF SECTION

SECTION 221316

STORM PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.

2. Specialty pipe fittings.

1.3 REFERENCES

A. Related Sections:

1. Section 221319 “Sanitary Waste and Storm Piping Specialties”.

1.4 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.5 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Gravity Piping: 10-foot head of water.

1.6 SUBMITTALS

A. Product Data: For pipe, tube, fittings, couplings, hangers, supports, hardware, inserts, etc.

B. Shop Drawings:

1.7 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp or other markings of specified testing agency.

B. All cast iron soil pipe and fittings shall be marked with the trademark of the Cast Iron Soil Pipe Institute (CISPI).

C. Installer – Company specializing in plumbing systems with 7 (seven) years minimum experience.

D. All cast iron pipe and fittings shall meet the CISPI 301 or ASTM A-888 quality standard and shall be listed and certified by IAPMO, ISS and NSF.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article and schedule on the drawings for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. This contractor will be required to submit a list for approval for all piping to be used, manufacturers name and pressure ratings for all systems.

C. Listed below are references to the specification standards of recognized authorities to which pipe and fitting materials must conform to be acceptable. All reference shall be the latest edition in force at the time of bidding.

D. Materials indicated are subject to approval of local governing authorities.

E. Each pipe length shall have the manufacturer's name, country of origin, date, pipe diameter and relevant testing agency stamp the information shall be permanently cast, stamped or rolled on.

F. Each fitting shall have the manufacturer's symbol and pressure rating cast, stamped or rolled on, and shall be pressure rated and suitable for the respective system.

G. Material Test Reports: Suppliers of cast iron soil pipe shall be able to supply material tests reports in accordance with the relevant ASTM standard and shall include testing and analysis on: radioactivity, dimensional characteristics, tensile strength and chemical/metallurgical content. Suppliers shall also supply MSDS sheets on all coatings.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, [Service] class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: CISPI 301 or ASTMA A-888.

B. CISPI 310 or ASTMA A-888, Standard Duty Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, [provide one of the following]:

    a. ANACO.
    b. Mission Rubber Company
    c. Ideal.
    d. Tyler Coupling.

2. Standards: ASTM C 1277 ASTM C1540 and CISPI 310. Standard duty couplings shall be certified by NSF International and shall have the NSF Mark on each coupling
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION WITHIN THE BUILDING ABOVE SLAB

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of roof drains. Install piping as required between existing piping and new roof drain.

B. Install fittings for changes in direction and branch connections.

C. Install piping and hangers to allow application of insulation, where required.

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." or manufacturers recommendations.

3.2 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" or manufacturer’s recommendation for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" or manufacturer’s recommendation for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3.4 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

3.5 PIPING SCHEDULE

A. Aboveground, soil, sanitary waste and vent piping any size shall be the following:

1. Service class, hub-and-spigot cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings; Standard-duty hubless-piping couplings; and coupled joints.

END OF SECTION

SECTION 221319

STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof Drains.

1.3 COORDINATION

A. Coordinate size and construction of roof deck.

PART 2 - PRODUCTS

2.1 DRAINS

A. General

1. This paragraph applies to all roof drains.
2. The drains selected are representative of the quality, design and finish desired. Drains of other manufacturers may be submitted provided they meet fully in every respect (such as materials, weight open areas, clamping features, grate surface and finish, etc.) the characteristics and quality of the drain specified.
3. Rood drains shall be; Watts RD-100-K-B-D 14-inch Epoxy Coated Cast Iron Roof Drain with Flashing Clamp / Integral Gravel Stop, (-K) ductile iron Dome, (-B) Sump Receiver and (-D) Underdeck Clamp.
4. All drains shall include adjustable clamping device where membrane, flashing, or other waterproof floors or decks occur.
5. All drains shall include suitable extension collars, sump receivers, under deck clamps, as required to suit roof construction.
6. On all areas requiring flashing, provide flashing extending at least 12” beyond drainage flange and connections made watertight.

2.2 ROOF DRAINS

A. Cast-Iron, General-Purpose Main Roof Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Wade.
d. Watts Water Technologies, Inc.

e. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: [Cast iron].
4. Combination Flashing Ring and Gravel Stop: Install where indicated.
5. Dome Material: ductile iron.
6. Perforated Gravel Guard; where required.

PART 3 - EXECUTION

3.1 ROOF DRAINS INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange or roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drains outlets.
3. Position roof drains for easy access and maintenance.

3.2 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 230500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this and the other sections of Division 23.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Sustainable Design Requirements – Division 01.
2. Cast-In place concrete – Division 03- Concrete
3. Steel Floor Decking – Division 05- Metals
4. Steel Roof Decking - Division 05- Metals
5. Metal Fabrications - Division 05- Metals
6. Firestopping - Division 07- Thermal and Moisture Protection
7. Flashing Wall and Roof Penetrations - Division 07- Thermal and Moisture Protection
8. Sealants and Caulking - Division 07- Thermal and Moisture Protection
9. Painting - Division 09 - Finishes
10. Division 21 – Fire Protection
11. Division 23 – Plumbing
12. Division 23 – Heating, Ventilating and Air Conditioning – All Sections
13. Division 26 – Electrical
14. Excavation and Backfill - Division 31 - Earthwork
15. Other Divisions of this Specification where applicable.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Implement practices and procedures to meet the project's environment goals which include designing to Boston Article 37 and LEED (Leadership in Energy and Environmental Design) green building standards without actual LEED certification. Ensure that the requirements related to these goals, as defined in Division 01 and this section are implemented to the fullest extent. It is the Contractor's responsibility to refer to the applicable Article 37 and LEED version being followed for this project and comply with the specific requirements. The Contractor shall inform the Architect and LEED Consultant should proposed substitutions or changes affect the stated LEED requirements. Substitutions, or other changes to the work proposed by the contractor or their Subcontractors, shall not be allowed without express written consent of the Architect and LEED Consultant.

1.4 REFERENCE STANDARDS

A. The reference standards listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Air-Conditioning, Heating and Refrigeration Institute (AHRI).

C. American National Standard Institute (ANSI):

D. Air Moving and Conditioning Association (AMCA):

E. American Society of Mechanical Engineers (ASME):

F. American Society for Testing and Materials (ASTM):

G. National Fire Protection Association (NFPA):

H. American Association of Balancing Contractors (AABC).

I. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

J. American Welding Society (AWS)

K. Cooling Technology Institute (CTI)

L. Environmental Protection Agency (EPA).

M. National Environmental Balancing Bureau (NEBB).

N. National Electrical Code (NEC)

O. Occupational Safety and Health Administration (OSHA).

P. Underwriters Laboratories (UL).

Q. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and as specified in Division 01 Section titled "SUBMITTAL PROCEDURES."

B. Prior to purchasing any equipment or materials, a list of their manufacturers shall be submitted for review.

C. Prior to assembling or installing the work, the following shall be submitted for review:

1. Scale drawings indicating insert and sleeve locations.
2. Scale drawings showing all piping and duct runs with sizes, elevations, equipment service clearance and appropriate indication of coordination with other trades. This submission to us shall consist of an electronic file submittal and 2 paper prints.
3. Catalog information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment.
4. Coordination drawings for access panel and door locations.
5. Shop drawings detailing fabrication and installation for supports for mechanical materials and equipment.

6. Mechanical Contractor shall submit complete air handling/air conditioning unit sheet metal and piping shop drawings to the unit manufacturer prior to submission to the Engineer. The unit manufacturer shall approve the air performance and acoustical performance of the units in the location and with the ductwork and piping configuration and construction as indicated on the shop drawing. Air handling/air conditioning unit manufacturer shall indicate approval directly on the shop drawing.
7. Welder Certificates signed by Contractor certifying that welders comply with requirements specified under AQuality Assurance@ in this section.

D. Documents will not be accepted for review unless:

1. They include complete information pertaining to appurtenances and accessories.
2. They are submitted as a package where they pertain to related items.
3. They are properly marked with service or function, project name, where they consist of catalog sheets displaying other items which are not applicable.
4. They indicate the project name and address along with the Contractor's name, address and phone number.
5. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

E. Shop Drawing Review

1. The purpose of the review of shop drawings is to maintain integrity of the design. Unless the contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, review by the Engineer or Architect does not constitute acceptance. It is not to be assumed that the engineer has read the text nor reviewed the technical data of a manufactured item and its components including where the Vendor has pointed out differences between his product and the specified model.

F. Explanation of Shop Drawing Stamp

1. Reviewed - No Exception Taken: indicates that we have not found any reason why this item should not be acceptable within the intent of the contract documents.
2. Exception Taken As Noted: indicates that we have found questionable components which if corrected or otherwise explained make the product acceptable.
3. Revised and Resubmit: indicates that this item should be resubmitted for review before further processing.
4. Resubmit Specified Item: indicates that the item will not meet the intent of the Contract.
5. Incomplete - Resubmit: Indicates that the submission is not complete and ready for review by the Architect or Engineer.
6. Verified for Electrical Services: Indicates that the electrical requirements have been confirmed with the electrical contract documents.
7. Architects Review Required: Indicates that the submission will require the Architect’s review.
8. Structural Review Required: Indicates that the submission will require the Structural Engineer’s review.
9. Acoustical Consultant Review Required: Indicates that the submission will require the acoustical consultant’s review.
10. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for Construction, the Contractor scheduling his own work, or the Owner.

1.6 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code Steel."

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. Products Criteria:

1. All equipment furnished as part of the work shall comply with the latest editions of all applicable state and municipal "energy codes." Provide certification from the equipment suppliers for all energy-consuming equipment that the equipment fully complies with these codes. Equipment submissions will not be accepted for review unless accompanied by such certification in writing.
2. All equipment and materials shall be new and without blemish or defect.
3. All products and equipment shall be tested and/or listed and labeled by approved agency, such as Underwriters Laboratories (UL), according to prescribed standard or by approved agency according to New York City Office of Technical Certification and Research (OTCR) approved criteria. It is the responsibility of this trade to demonstrate or obtain and pay for all costs and fees of such approval and, when applicable, to prepare and submit an alternative product application to OTCR for review and approval.
4. All equipment and materials shall be free of asbestos.
5. Electrical equipment and materials shall be products which will meet with the acceptance of the agency inspecting the electrical work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be examined, tested and certified. Where no specific indication as to the type or quality of materials or equipment is indicated, a first-class standard article shall be furnished.
6. It is the intent of these specifications that wherever a specific manufacturer of a product is specified or scheduled, and the specifications include other approved manufacturers or the terms "other approved" or "or approved equal" or "equal" are used, the submitted item must conform in all respects to the specified item. Consideration will not be given to claims that the submitted item meets the performance requirements with lesser construction (such as lesser heat exchange surface, smaller motor HP, etc.). Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance. In many cases equipment is oversized to allow for pick-up loads which cannot be delineated under the minimum performance.
7. All equipment of one type (such as fans, pumps, coils, etc.), shall be the products of one Manufacturer.

D. Manufacturer's Recommendations: Where installation procedures of any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Unit shall be stored and handled in accordance with manufacturer's instructions.

C. Unit shall be shipped with all listed items and control wiring factory installed unless noted on the submittals and approved prior to shipment.

D. Unit shall be shipped complete as specified. Parts for field installation shall not be shipped and stored on site without prior approval.

E. Rigging: Units shall be fully assembled. Units requiring disassembly for rigging shall be factory assembled and tested. Disassembly, reassembly and testing shall be supervised by the manufacturer's representative.

F. Unit shall be shipped with firmly attached labels that indicate name of manufacturer, model number, serial number, and plan tagging.

G. The Vendor shall shrink wrap all electronic equipment and spare parts prior to shipping. Spare parts are to be delivered at time of owner acceptance.

H. Deliver, store and handle all materials to keep clean and protected from damage.

I. Store products in shipping containers and maintain in place until installation.

J. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

K. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

L. Protect flanges, fittings, and piping specialties from moisture and dirt.

M. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

N. Protect equipment and other materials from damage after installed from construction debris and other damage.

1.8 PRECONSTRUCTION CONFERENCE PRIOR TO START OF WORK

A. Prior to commencing any Work, the CM, together with designated major Contractors, shall confer with the Architect and Engineer concerning the Work under the Construction Contract.

B. The pre-construction conference will be conducted under the leadership of the CM and will occur soon after the CM notifies the Subcontractors of contract award. The pre-construction conference will focus on items such as the expedited submittal review procedure, interface and coordination between Contractor work scope, the CM's project site rules and requirements, temporary utility requirements, CM's construction schedule, etc.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. See paragraph titled “Separation of Work Between Trades” to determine whether access panels and doors the responsibility of the Contractor for Division 08 or the Contractor responsible for Division 23.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

1.10 INCENTIVE PROGRAM GENERAL REQUIREMENTS

A. Provide the Owner with assistance to meet the requirements of the rebate or incentive program. The Contractor is responsible for all information that is needed for the satisfactory demonstration of compliance as mandated in these guidelines. Contractor to coordinate required activities and plan responsibilities with the Construction Manager for all plans developed for the Project.

1. Equipment

a. For equipment which qualifies for rebates and which has been included in the Base Bid work as part of these specifications and/or the associated contract drawings, assist in the preparation of all applications, work sheets, and other documentation required in order to ensure eligibility for rebate.
b. Obtain written confirmation of eligibility from the agency offering the rebate and/or Construction Manager (CM) before placing orders for any such equipment.
c. Schedule the filing of the documentation, the ordering of the equipment and the installation of the equipment so as to guarantee compliance with all requirements. Notify the Architect in writing if these requirements will delay the building construction schedule.

2. Budgeting and Costing

a. Provide cost data from vendors and for their own work for all items and Energy Efficiency Measures (EEMs) made part of the incentive funding application. Where guidelines provide alternative approaches to requirements, the Contractor shall perform cost comparisons to assist the Owner and the design team in selecting the best option.
b. Where guidelines require reporting of incremental cost differences between equipment and systems, the Contractor shall perform cost comparisons to assist the Owner in developing the required reports.

3. Records and Documentation

    a. Provide product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.
    b. Provide invoices demonstrating the costs of equipment and materials.
    c. Retain any pertinent information supporting that the installed work meets applicable laws, ordinances, codes, regulations, industry guidelines and other applicable requirements such as Energy Star labeling.

1.11 COORDINATION

A. Arrange for duct spaces, pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

D. Provide all designating signs for shutoff valves, control valves, alarms, and the like, as required by the agencies having jurisdiction.

1.12 COORDINATION DRAWINGS

A. Prepare coordination drawings in accordance with Division 01 Section titled "PROJECT COORDINATION," and in accordance with Section HVAC trade coordination drawings to a scale of 3/8"=1'-0" or larger; detailing major elements, equipment components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. The coordination drawings shall be produced using AutoCad 2011 or later software. The design drawings will be made available on disks in AutoCad format for use as a basis for the "Coordination" drawings. These documents remain the property of Cosentini Associates and shall be used for no other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings.
2. Indicate the proposed locations of piping, ductwork, equipment, and materials. Include the following:

    a. Planned piping layout, including valve and specialty locations and valve stem movement.
    b. Planned duct system layout, including elbow radii and duct accessories.
    c. Clearances for seismic supports and restraints.
    d. Clearances for installing and maintaining insulation.
    e. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
    f. Equipment connections and support details.
    g. Exterior wall and foundation penetrations.
    h. Fire-rated wall and floor penetrations.
    i. Sizes and location of required concrete pads and bases.
    j. Clearances as required by Electric Code.

3. Indicate piping loads and support points for all piping 3" and larger, racked piping, and submit to the Structural Engineer for review and approval. Indicate the elevation, location, support points, and loads imposed on the structure at support, anchor points, and size of all lines. Indicate all beam penetrations and slab penetrations sized and coordinated. Indicate all work routed underground or embedded in concrete by dimension to column and building lines.
4. Identify all equipment and systems (if any) installed as part of the work of this Division that by Code require seismic restraint. Refer to Section 23 05 46 or section 23 05 47 of these specifications as applicable
5. Indicate seismic support and restraint for all piping, ductwork and equipment installed as part of the work of this Division and specified under another section of Division 23.
6. Identify all equipment and systems installed as part of the work of this Division that by Code do not require seismic restraint but whose failure in a seismic event may cause due to their proximity and relative position the failure of the components that do require seismic restraints and are installed as part of work of this Division or other Divisions.
7. Indicate seismic support and restraint for equipment and system identified above.
8. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
9. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
10. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

B. HVAC COORDINATION DRAWINGS

1. This Contractor shall prepare a complete set of construction Coordination Drawings showing all of the HVAC work (equipment, piping, ductwork, conduit, etc.) to be installed as part of the work of this section of the specifications.
2. All seismic supports and restraints if required as part of the seismic design (as outlined under another section of this work) shall be shown on the coordination drawings.
3. The Coordination Drawings shall be prepared on electronic media (CADD) at not less than 3/8": 1'-0" scale.
4. Requirements for vibration isolation shall be shown on the coordination drawings by each trade.
5. The HVAC coordination drawings shall serve as the base drawing to which all other contractors will overlay and add their work.
6. This Trade after showing all of the HVAC work shall forward the reproducible Coordination Drawings to the Plumbing Contractor.
7. The sequence of coordination drawings shall be HVAC-PLBG-FP-ELEC-CM/GC.
8. The HVAC Contractor shall be designated as the lead contractor in the development of the composite layering process and shall be responsible for electronically restacking the various trade layers into the final composite (CADD) Drawings. Each trade shall draw their Work on separate layers represented by individual colors.
9. The HVAC Contractor shall attend a series of meetings arranged by the General Contractor to resolve any real or apparent interferences or conflicts with the work of the other Contractors or with ceiling heights shown on the architectural drawings.
10. The HVAC Contractor shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts.
11. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the HVAC Contractor shall Asign-off@ the final Coordination Drawings.

12. The HVAC Subcontractor shall not install any of his work prior to Asign-off@ of final Coordination Drawings. If HVAC work proceeds prior to sign-off of Coordination Drawings, any change to the HVAC work to correct the interferences and conflicts which result will be made by the HVAC Contractor at no additional cost to the project.
13. Coordination Drawings are for the HVAC Contractor=s and Owner=s use during construction and shall not be construed as replacing any shop, “as-built”, or Record Drawings required elsewhere in these Contract Documents.
14. Review of Coordination Drawings shall not relieve the HVAC Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.13 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, comply with the following:

1. A complete set of "as-built" or record drawings shall be made up and delivered to the Architect.
2. The drawings shall show:

    a. Ductwork mains and branches, size and location, for both exterior and interior; locations of all dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
    b. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Refer to Division 23; Section titled “Identification for HVAC Piping, Ductwork and Equipment”. Indicate horizontal locations of underground piping.
    c. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
    d. Seismic restraints and supports.
    e. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
    f. All "main air" pneumatic control piping routing locations must be shown (if applicable).
    g. Updating of all equipment schedule sheets.

B. This trade shall submit the "as-built" set for approval by the building department, when required by the jurisdiction.

C. The quantity of design drawings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required "as-built" information.

D. Progress prints of record drawings shall be submitted monthly during the construction period for Architect's review.

E. As-built drawings for filing with the Building Department (where required) shall be prepared at the same scale, in the same plan format and use the same symbols and nomenclature as the plans filed by Engineer of Record with the Building Department for “Building Permit.”

1.14 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. List of spares: recommended for normal service requirements.
6. Parts list: identifying the various parts of the equipment for repair and replacement purposes.
7. Instruction books may be standard booklets but shall be clearly marked to indicate applicable equipment.
8. Wiring diagrams: generalized diagrams are not acceptable. A submittal shall be specifically prepared for this project.
9. Automatic controls: diagrams and functional descriptions. (See control specification for additional requirements).

1.15 CODES, PERMITS AND INSPECTIONS

A. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over construction work at the project.

B. All required permits and inspection certificates shall be obtained, paid for, and made available at the completion of the work.

C. Any portion of the work which is not subject to the approval of an authority having jurisdiction, shall be governed by the applicable sections of the overall National Fire Code, as published by the National Fire Protection Association.

D. Installation procedures, methods, and conditions shall comply with the latest requirements of The Federal Occupational Safety and Health Act (OSHA).

E. Prepare and submit to the building department a set of "as-built" record drawings for approval, in a form acceptable to the building department.

F. This Contractor shall prepare all plans, amendments and pay all filing fees that will be required for the fuel burning installation, gas piping, breeching, and any or all parts of the system under the jurisdiction of the controlling agencies.

G. This Contractor shall prepare all plans, amendments and pay all filing fees that will be required for the emergency generator installation, including oil piping, engine exhaust, fuel oil tanks, and any or all parts of the system under the jurisdiction of the controlling agencies.

H. This Contractor shall prepare all plans, amendments, and pay all filing fees that will be required for the electric generator and electric generator fuel oil tank installation.

I. This Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction.

1.16 SEPARATION OF WORK BETWEEN TRADES

A. The specifications for the overall construction delineate various items of work under separate trade headings. The list below sets forth this delineation to the extent that it affects the HVAC work.

B. In the absence of more detailed information, this list shall be taken as a specific instruction to the heating, ventilating and air conditioning trade to include the work assigned to it.

C. Indications that the heating, ventilating and air conditioning trade is to perform an item of work mean that it is to perform the work for its own accommodation only, except as specifically noted otherwise.

Oth = Divisions other than Electrical (Division 26) or Mechanical (Divisions 21, 22 & 23)
Plb = Plumbing
Htg = Heating, Ventilating & Air Conditioning
Elec = Electrical
F = Furnished
I = Installed
P = Provided (furnished and installed)

Item	Oth	Plb	Htg	Elec	Notes
Motors for mechanical equipment.			p		
Motor Starters for Mechanical Equipment			F	I	Specifications and Drawings delineate exception
Controls Device for Mechanical Equipment			p		
Power wiring for mechanical equipment motors.				p	Specifications and drawings delineate exceptions.
Control wiring for motors.			p		Specifications and drawings delineate exceptions.
Wiring for automatic dampers.			p		Specifications and drawings delineate exceptions.
Temporary heat.	p				
Temporary water.	p				

Item	Oth	Plb	Htg	Elec	Notes
Sealing of pressurized stairway, shafts and doors.	p				
Undercutting of doors and door louvers.	p				Supplying location where required included in HVAC.
Temporary light & power.	p				
Hoisting			p		
Rigging			p		
Cutting, chasing & patching	p				Cost where due to late installation or improper coordination of work is the responsibility of the delinquent trade.
Framed slots and openings in walls, decks, and slabs.	p				Coordination drawings are required from HVAC trade.
Sleeves through non-membraned slabs, decks and walls.			p		
Drilling & cutting of all holes in steel decks and precast slabs required for sleeves & supports.			p		
Sleeves through membraned slabs, decks and walls.			p		
Waterproof sealing of sleeves through membraned slabs, decks and walls.			p		
Fireproof sealing of excess openings in slabs, decks & fire rated walls.			p		
Concrete encasement of underground runs	p				
Trenches in floor slabs	p				
Excavation and backfill inside buildings.	p				
Excavation and backfill outside buildings.	p				

Item	Oth	Plb	Htg	Elec	Notes
Wells or openings in piping for pressure, temperature, flow, etc.			p		Wells and fittings furnished by BMS Contractor.
Keeping site and excavations free from surface water during construction.	p				To accommodate the overall project.
Fastenings			p		
Supports			p		
Steam manholes	p				Furnishing of covers, associated frames and other hardware included in HVAC trade.
Base flashing to all roof penetrations	p				
Roof vent and pipe cap flashing.			p		
Roof vent and base flashing.	p				
Roof curb cap flashing.			p		
Roof curb base flashing	p				
Concrete foundations, pads & bases inside buildings.	p				Furnishing of anchors, vibration mounts and seismic restraints included in the HVAC trade.
Concrete foundations, pads & bases outside buildings.	p				Furnishing of anchors, vibration mounts, and seismic restraints included in the HVAC trade providing the associated equipment.
Field touch-up painting of damaged shop coats.			p		
Rustproofing field cut and assembled iron supporting frames and racks.			p		
Finish painting of exposed work.	p				Insulation coatings are by HVAC trade.

Item	Oth	Plb	Htg	Elec	Notes
Ornamental grills.	p				Duct connections included in HVAC trade.
Exterior wall louvers.	p				Duct connections & safing of all unused portions of louvers (2" thick insulated panel) is by HVAC Trade.
Finished Wall and Ceiling Access Doors and Supporting Frames	P				Supplying list locating all required access doors (none to be less than 16” x 16”) included in HVAC
Fire rated duct and pipe wrap enclosures			p		
Thermal insulation for mechanical room ceilings.	p				
Chimney breeching frames.	p				
Chimney clean-out doors.	p				
Prefabricated chimneys.			p		
Heating Convector Enclosure			p		
Architectural Fin-tube Radiation Enclosure	P				
Integral Fin-tube Radiation Enclosure			p		
Catwalks to mechanical equipment.	p				Supplying list of locations where required included in HVAC.
Ladders to mechanical equipment other than cooling towers	p				Supplying list of locations where required included in HVAC.
Ladders to roof mounted AC units and HVAC equipment.			p		Coordinate with Architect and Structural Engineer.
Steel dunnage for roof mounted AC units and HVAC equipment other than cooling towers.			p		Coordinate with Architect and Structural Engineer.

Item	Oth	Plb	Htg	Elec	Notes
Domestic make-up water piping for heating and air conditioning systems.		p			Final connections included in heating, ventilation and air conditioning.
Kitchen range hoods.	p				Duct connections included in heating, ventilation and air conditioning.
Control valves for domestic hot water heaters.		f	i		
Dishwashing hoods.	p				Duct connections included in HVAC trade.
Walk-in refrigerator.	p				Line connections included in electric.
Laboratory and medical equipment.	p				Line connections included in HVAC trade.
Fume Hoods	p				Duct connections included in HVAC
Rubbish removal			p		Where one trade furnishes and another installs, the installing trade removes the shipping and packing materials which accumulate.
Special tools for equipment maintenance.			f		Special tools are defined as tools proprietary to a particular type or piece of equipment.
Electric duct heaters (heaters installed in air ducts).			p		Line connections included in electric. Drawings delineate exceptions.
Electric heaters with integral fans (cabinet heaters, unit heaters and the like).			p		Line connections included in electric. Drawings delineate exceptions.
Gratings over open shafts within MER			p		
Electric radiators (baseboard, sill line, and convector type heaters).				p	

Item	Oth	Plb	Htg	Elec	Notes
Through wall sleeve type air conditioning and electric heating units.			p		
Electric heater cables for radiant space heating.				p	
Electric heater cables for snow melting.				p	
Electric heater cables for pipe tracing.				p	Line and control connections and control device mounting included in electric.
Masonry shafts, sheet rock shafts, tunnels, utilized for air ducts.	p				This trade to assure the air tightness of all joints, holes and other openings to make these air conveyors acceptable for their function.
Trolley beams for equipment access and removal			p		HVAC contractor to design trolley beams (and all additional required structural supports) to be located over equipment to permit removal of equipment. Coordinate with structural engineer. Trolley beams and supplemental steel to be provided by the HVAC contractor.
Access platforms for roof mounted AC units			p		Manufacturer to design access platforms with all associated structural elements to be furnished and installed by the HVAC contractor.

K. The Heating, Ventilating and Air Conditioning Contractor is required to supply all necessary supervision and coordination information to any other Contractors who are to supply work to accommodate the Heating, Ventilating and Air Conditioning installations.

L. Where the Heating, Ventilating and Air Conditioning Contractor is required to install items which it does not purchase, it shall include for such items:

1. The coordination of their delivery.

2. Their unloading from delivery trucks driven into any designated point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field assembly and internal connection as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

M. Items which are to be installed, but not purchased as part of the work of the Division 23, shall be carefully examined by this Contractor upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of Division 23 will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work of this Contractor shall include all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.17 DEFINITIONS

A. Specific items of terminology, as used herein or on drawings, shall have the following meanings.

1. "Piping"----------Pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents, and items customarily required in connection with the transfer of fluids.
2. "Concealed"----------Embedded in masonry or other construction, installed behind wall furring, within double partitions or hung ceilings, in crawl spaces, in shafts.
3. "Exposed"----------Not concealed.
4. "By Other Trades" or "Others" or "Oth"-------By persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of Division 23. In the event that this document is used to acquire work as part of a general construction contract the words "by other trades" shall mean by persons or parties who are not anticipated to be the sub-contractor for Division 23 working together with the general contractor. In this context the words "by other trades" shall not be interpreted to mean not included in the overall contract.
5. Where reference is made to N.E.M.A. Standards, it shall be understood that this reference is to the "Approved Standards", published by the National Electrical Manufacturers Association, Main Office - 155 East 44th Street, New York, New York 10017.
6. Where reference is made to "A.N.S.I. Standards", it shall be understood that this reference is to the standards published by the American National Standards Institute Incorporated.

1.18 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

A. As used in the drawings and specifications, certain non-technical words shall be understood to have specific meanings as follows:

1. "Furnish"----------Purchase and deliver to the project site complete with every necessary appurtenance and support.

2. "Install"----------Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
3. "Provide"----------"Furnish" and "Install".

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.

D. No exclusions from, or limitations, in the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.

E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations The work shall be installed, in accordance with the diagrammatic intent expressed on the electrical and mechanical drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings and in accordance with the contractor=s coordination drawings.

F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

I. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

J. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by Bulletin is subject to the base building specifications in all respects.

1.19 WORKMANSHIP

A. The entire work provide in this Specification shall be constructed and finished in every aspect in a workmanlike and substantial manner.

B. It is not intended that the Drawings shall show every duct, pipe, fitting, equipment and appliance. HVAC Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice.

C. Keep other trades fully informed as to shape, size and position of all openings required for apparatus and give full information to the General Contractor and other trades in a timely manner so that all opening may be built in advance. Furnish and install all sleeves, supports and the like as specified or as required.

D. In case of failure on the part of the HVAC Contractor to give proper and timely information as required above, he shall do his own cutting and patching or have same done by the General Contractor, but in any case, without extra expense to the Owner.

E. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the General Contractor and other trades which may be necessary to facilitate work and completion of the whole project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 OPERATING INSTRUCTIONS

A. After all final tests and adjustments have been completed, fully instruct the proper Owner's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.

3.2 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks or defects. Any defective materials or workmanship as well as damage to the work of all trades resulting from same shallbe replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use. For example, in the case of refrigeration systems, it means that the plant has a cooling load. Similarly, for all other systems.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Non-durable replaceable items such as air filter media do not require replacement afterthe date of acceptance. If received in writing, requests to have earlier acceptance dates established for these items will be honored.

E. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of heating and air conditioning equipment.

3.3 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Division 02 through Division 33 for rough-in requirements.

3.4 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install access panel or doors for maintenance or inspection where units are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Sections titled “Access Doors and Frames” and Security Access Doors and Frames and a subsequent paragraph of this Section of Division 23.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.5 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01 Section “Cutting and Patching.”

3.6 PROTECTION AND CLEANING

A. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks and covered with tarpaulins.

B. The inlet and discharge openings of all terminal units shall be kept covered until all local plastering, parging, etc. is completed, and the units are ready to run. The inlet and discharge openings of fans, air handling units, Roof Mounted Air Conditioning Units, pumps, etc. shall be kept covered until connected to system.

C. Equipment and material if left in the open and damaged shall be replaced, repainted, or otherwise refurbished at the discretion of the owner. Equipment and material is subject to rejection and replacement if in the opinion of the engineer, or in the opinion of the manufacturer's engineering department, the equipment has deteriorated or been damaged to the extent that its immediate use is questionable, or that its normal life expectancy has been curtailed.

D. During the erection protect all ductwork, duct lining, insulation, piping, and equipment from damage and dirt. Cap the open top and bottom of all ductwork and piping installed.

E. After completion of project, clean the exterior surface of all equipment included in this division of work including, but not limited to, concrete residue.

3.7 FLUSHING AND CLEANING OF PIPING

A. All piping systems shall be thoroughly flushed out with the approved cleaning chemicals to remove pipe dope, slushing compounds, cutting oils, and other loose extraneous materials. This also includes any piping systems which are not listed as requiring water treatment.

B. Develop plan for flushing and cleaning piping. Submit plan for approval prior to completion of piping. Provide all temporary and permanent piping, equipment, materials necessary to complete flushing and cleaning.

C. Prior to flushing, temporarily remove, isolate or bypass dirt sensitive equipment and devices, including but not limited to the following:

1. Automatic flow control valves
2. Heating and cooling coils
3. Chillers
4. Boiler
5. Heat exchangers
6. Flow measuring devices
7. Reinstall after flushing is complete.

D. Prior to flushing, install fine mesh construction strainers at inlet to all equipment with connections 2 1/2" and larger. Install fine mesh construction element in permanent strainers. During flushing and cleaning, remove and clean strainers periodically. At completion of final flush, clean permanent strainers, remove construction strainers.

E. Flush all piping with cold water for a minimum of 6 feet per second for one hour, until water runs clear. Water supply shall be equivalent to piping to be flushed. Drain all low points.

F. Circulate flush water and clean strainers prior to installing cleaning chemicals. Provide cleaning chemicals, under the direction of the chemical supplier. Following flushing, install cleaning chemicals and circulate through the entire system for a minimum of one hour, or as directed by chemical supplier. Take water sample for owner's use. Drain system, including all low points.

G. Flush, drain and fill system, circulate for one hour, sample for owner's use. Drain, flush, fill, circulate and sample until system is free of cleaning chemicals, as indicated by analysis of samples.

H. Provide temporary pumps and piping to chemically clean piping at a minimum velocity of 6 fps without using the system pumps.

I. The cleaning chemicals shall be added by the mechanical trade. The chemical supplier shall verify that the chemicals are compatible with all the materials in the systems. The chemical supplier shall instruct as to the proper feed rates, shall check that the cleaning solution is actually in each system, shall instruct the contractor as to when to flush the system and shall check each system following flushing to insure all cleaning chemicals have been removed from each system.

J. A certificate of cleaning shall be provided by the cleaning chemical supplier to the Architect's representative.

3.8 FIRE AND SMOKE DETECTION

A. Fire and smoke detection system will be provided and installed as part of the work of Division 26. The Contractor responsible for the work of Division 23 shall provide suitable openings (as recommended by the Smoke Detection System Manufacturer) in sheet metal for sensing elements.

B. The Contractor responsible for the work of Division 23 shall provide access doors to make all such detection heads accessible.

C. The Contractor responsible for the work of Division 23 shall provide bracing for smoke detection sampling tubes which exceed 48" in length.

3.9 DRIVE GUARDS

A. For all machinery and equipment (whether factory-fabricated or field-installed) provide OSHA approved guards for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor.

B. Materials: Sheet steel, cast iron, expanded metal or heavy gauge wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.

C. Access for Speed Measurement: One inch diameter hole at each shaft center.

3.10 FIRE-STOPPING

A. Refer to Division 08 titled “Thermal and Moisture Protection” for fire-stopping requirements.

B. Contractor responsible for the work of Division 23 shall be responsible for fire-stopping of all work installed as part of the work of Division 23.

C. Firestopping system must be U.L. approved.

D. All spaces between ducts or pipes and their respective sleeves shall be packed full depth with mineral wool, or other equally approved fire-resistant material, and compressed firmly in place. Fiberglass shall not be used. Sleeve clearances shall not exceed 2 inches between pipes (or ducts) and sleeves. Use individual sleeves for each pipe or duct. Use escutcheons on both sides of sleeves. This includes spaces between ducts on pipes and their respective sleeves or openings at fan rooms (whether walls are fire rated or not).

3.11 TOOLS AND LUBRICANTS

A. Furnish special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.

B. Lubricants: A minimum of one quart of oil, and one pound of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

3.12 PAINTING AND FINISHING

A. Refer to Division 09 titled "Finishes" for painting requirements.

B. Damage and Touch Up: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

C. Provide prime coat painting for the following if not provided with factory applied corrosion protection.

1. Miscellaneous steel and iron provided by Contractor responsible for the work of Division 23.
2. Hangers and supports iron provided by Contractor responsible for the work of Division 23.
3. Miscellaneous steel and iron provided by Contractor responsible for the work of Division 23 installed outdoors shall be provided with finished coats of exterior paint in accordance with requirements of Division 09 titled “Finishes” in addition to prime coat.

3.13 EXCAVATION AND BACKFILL

A. All excavation and backfill for HVAC work will be done by the HVAC Trade.

B. The work includes removal of surface improvements, excavating including hand excavation, sheeting, shoring, bracing, maintaining and protecting existing structures, utilities, pavements, shrubbery; dewatering by pumping of all water from excavation, bedding, backfilling, and compacting, restoration of surface improvements and cleaning up of the site.

C. Instructions:

1. Trenches shall be excavated so that pipe can be laid to the alignment and depth indicated on the drawings and shall be excavated only so far in advance of pipe laying as approved.
2. Width of trenches shall be held to a minimum consistent with the type of material encountered and the size of piping being laid, but the width at the top of the pipe shall not be more than 2 feet plus outside diameter of pipe. Excavation for manholes and other accessories shall have 12 inch minimum and a 24 inch maximum clearance on all sides.

3. Before fill or backfilling commences, all trash, debris, and other foreign material shall be removed from trenches to be backfilled by this Trade. Fill material shall be free from timber, rocks 3" or larger, organic material, frozen material, and other unsuitable material as determined by the Architect. Filling shall not be done in freezing weather, unless specifically approved. No filling shall be done when material already in place is frozen.
4. In filling around pipe, deposit backfill material in successive horizontal layers not exceeding 6" in thickness before compaction. Compact each layer thoroughly by means of approved mechanical tampers. Tech special care to obtain compaction under pipe haunches. Deposit backfill adjacent to pipes on both sides to approximately same elevation at the same time. Continue this method of filling and compacting until backfill is at least 18" above top of pipe.
5. Backfilling for the remainder of pipe trenches to subgrades of paved or landscaped areas shall be done by mechanical tamping and rolling equipment, except that the use of such equipment is prohibited when said use may result in damage to pipelines or structures.
6. All copper tubing laid in ground shall be backfilled around and one (1) foot over with good clean earth, free from stone or cinders, carefully tamped under and around the tubing for its full length. The remainder of the backfill shall be free from stones larger than (3) inches in diameter and shall be satisfactorily compacted by puddling and tamping.
7. Backfill shall be moistened as necessary for proper compaction. Water settling of fill will not be permitted.
8. Complete backfilling of pipe trenches as soon as possible after the pipe is laid and tested.
9. Existing pavements, roadways, walkways, curbs and landscaped areas disturbed during the progress of the excavation and backfill work shall be restored to their original condition at no additional cost to the Owner.
10. Backfill shall be compacted to a minimum of 90% of modified AASHO maximum density as defined by ASTM D-1557. Any layer of fill, or portion thereof, which is not compacted to the required density shall be recompacted until the specified density is achieved, or the layer shall be removed.

3.14 ACCESS DOORS IN FINISHED CONSTRUCTION

A. Access doors as required for operation and maintenance of concealed equipment, valves, controls, etc. will be provided as part of the work of Division 08.

B. This Contractor is responsible for access door location, size and its accessibility to the valves, controls, equipment, etc. being served.

C. Coordinate and prepare a location, size, and function schedule of access doors required and deliver to a representative of the Contractor for Division 08.

D. Furnish and install distinctively colored buttons in finished ceiling.

E. Access doors shall be of ample size to perform proper maintenance on concealed equipment, valves, controls, etc. but shall not be less than a minimum of 18" x 18".

F. Construct doors and frames to comply with the requirements of the NFPA and Underwriters Laboratories Inc. for fire rating. Install UL label on each door in a non-exposed location unless otherwise required by the local authority having jurisdiction.

3.15 REMOVALS AND ALTERATIONS

A. Comply with requirements of Division 02 titled “Existing Conditions”

B. This contractor shall provide all required labor, materials, equipment and perform all operations for complete demolition, removal and relocation of the existing work as indicated on the drawings and/or as specified or described and/or as required for the performance of the general work under this contract.

C. Disconnect, demolish and remove HVAC equipment and components indicated to be removed. The work shall include but not be limited to the following:

1. Piping to be Removed: Remove portion of piping to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to be Abandoned in Place: Drain piping and cap or plug remaining piping with same or compatible piping material.
3. Ducts to be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to be Removed: Disconnect and remove equipment. Cap all services connected to equipment
6. Equipment to be Removed and Reinstalled: Disconnect and remove equipment. Cap all services connected to equipment. Clean and repair equipment as required to so equipment is fully operational. Store equipment and schedule requires, reinstall equipment, connect all services and make equipment operational.
7. Equipment to be Removed and Salvaged: Disconnect and remove equipment. Cap all services connected to equipment. Deliver equipment to Owner's Representative.

D. If ductwork, piping, insulation or equipment to remain is damaged in appearance or is unserviceable, remove damage or unserviceable portions and replace with new products of equal capacity and quality.

E. All removed equipment and material shall be removed from the project site.

F. Unless otherwise specifically specified, include all cutting and patching of existing floors, walls, partitions and other materials in the existing building. The Contractor shall restore these areas to original conditions.

G. Provide alteration work as shown on drawings or described herein. If asbestos is present or suspected to be present inform the Owner in writing so that such removal can be carried out by qualified personnel hired by the Owner. Do not commence demolition until such work has been completed.

3.16 CONNECTIONS TO EXISTING WORK

A. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing facilities. Submit to the Owner for approval, date schedule of necessary temporary shutdowns of existing services. All shutdowns shall be made at such times as will not interfere with regular operation of existing facilities and only after written approval of Owner. To insure continuous operation, make necessary temporary connections between new and existing work. All costs resulting from temporary shutdowns shall be borne by this Contractor.

B. The drawings of necessity utilize symbols and schematic diagrams to indicate connections to existing work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations.

C. The contractor shall coordinate all connections to existing work with the facility engineer. Contractor shall field verify exact location of all existing services.

D. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.

3.17 PRE-OCCUPANCY SPACE FLUSH OUT

A. At completion of construction, prior to turn over of the building, the contractor shall conduct a pre-occupancy flush out of the system as follows:

1. All supply air systems shall be run at 100% fan capacity for a period of two weeks.
2. During the flush out, all outside air dampers shall be locked into the 100% outside air position. Return air dampers shall be fully closed and all spill air dampers shall be 100% open. Exhaust fans shall be operated at 100% exhaust.
3. Cooling and/or heating coil valves shall be controlled by the building management system to provide properly tempered and dehumidified air.

    a. Supply air temperature shall be set to provide a maximum space temperature of 78°F, minimum space temperature of 66°F and a maximum space humidity of 60% RH.

4. All exhaust fans that are required to run to maintain proper building pressurization shall be operated at 100% fan capacity for the flush out period.
5. If operation of the air systems in 100% outside air mode will not allow maintaining the above conditions, the systems may operate in partial recirculation mode. The duration of the flush-out shall be extended as required to circulate the same amount of outside air.

3.18 REFRIGERANT HANDLING

A. Refrigerant Installation and Disposal: Perform all work related to refrigerant contained in chillers, cooling coils, air conditioners, and similar equipment, including related piping, in strict accordance with the following requirements:

1. ASHRAE Standard 15 and Related Revisions: Safety Code for Mechanical Refrigeration.
2. ASHRAE Standard 34 and Related Revisions: Number Designation and Safety Classification of Refrigerants.
3. United States Environmental Protection Agency (US EPA) requirements of Section 808 (Prohibition of Venting and Regulation of CFC) and applicable State and local regulations of authorities having jurisdiction.

B. Recovered refrigerant is the property of the Contractor. Dispose of refrigerant legally, in accordance with applicable rules and regulations of authorities having jurisdiction.

END OF SECTION

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes general administrative and procedural requirements for Electrical installations. The administrative and procedural requirements specified herein are included in this Section to expand the requirements specified in Division 01.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

B. This section is a part of each Division 26 Section.

1.3 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for major equipment items such as panelboards and other items as specified elsewhere.

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Unit shall be stored and handled in accordance with manufacturer's instructions.

C. Unit shall be shipped with all listed items and control wiring factory installed unless noted on the submittals and approved prior to shipment.

D. Unit shall be shipped complete as specified. Parts for field installation shall not be shipped and stored on site without prior approval.

E. Rigging: Units shall be fully assembled. Units requiring disassembly for rigging shall be factory assembled and tested. Disassembly, reassembly and testing shall be supervised by the manufacturer's representative.

F. Unit shall be shipped with firmly attached labels that indicate name of manufacturer, model number, serial number, and plan tagging.

G. The Vendor shall shrink wrap all electronic equipment and spare parts prior to shipping. Spare parts are to be delivered at time of Government acceptance.

H. Deliver, store and handle all materials to keep clean and protected from damage.

I. Store products in shipping containers and maintain in place until installation.

J. Protect equipment and other materials from damage after installed from construction debris and other damage.

1.5 CODES, PERMITS AND INSPECTIONS

A. All work shall meet or exceed the latest requirements of all national, state, county, municipal, and other authorities exercising jurisdiction over electrical construction work and the project.

B. All required permits and inspection certificates shall be obtained, paid for, and made available at the completion of the work.

C. Any portion of the work that is not subject to the requirements of an electric code published by a specific authority having jurisdiction shall be governed by the National Electrical Code and other applicable sections of the National Fire Code, as published by the National Fire Protection Association.

D. Equipment, material, layout and installation provided as part of the electrical work shall conform to the requirements of all agencies having jurisdiction. Include as part of the electrical work all required filings and submissions for approval. Equipment furnished separate from - but installed as part of - the electrical work, which does not have all necessary approvals, shall not be installed until approvals are obtained by the parties furnishing the equipment.

E. Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Administration (OSHA).

F. All equipment furnished as part of the electrical work shall comply with the latest editions of all applicable state and municipal “energy codes.”

1.6 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from defects. Any defective materials or workmanship as well as damage to the work of all trades resulting from same shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Non-durable items such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.

E. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of electrical equipment for which such certification is required.

1.7 SEPARATION OF WORK BETWEEN TRADES

A. The specifications for the overall construction delineate various items of work under separate trade headings. The list below sets forth this delineation to the extent that it affects the electric work.

B. In the absence of more detailed information, the list shall be taken as a specific instruction to the electrical trade to include the work assigned to it.

C. Indications that any trade is to perform an item of work means that it is to perform the work for its own accommodation only, except as specifically noted otherwise.

Oth = Divisions other than Electrical (Division 26); Mechanical (Divisions 21, 22 & 23)
Plb = Plumbing
Htg = Heating, Ventilating & Air Conditioning
Elec = Electrical.
f = Furnished.
i = Installed.
p = Provided (furnished and installed).

Item	Oth	Plb	FP	Htg	Elec	Note
Motors for mechanical equipment.		p	p	p		
Motor controllers for: Htg Plb		 f		 f	 i i	Specifications and drawings delineate exceptions. Includes motor control centers if applicable.
Motor control devices for: Htg Plb		 p		 p		Specifications and drawings delineate exceptions. Control devices for mounting within controller are provided integral with controller.
Power wiring for motors: Htg Plb					 p p	
Control wiring for motor controllers: Htg Plb				 p	 p	Specifications and drawings delineate exceptions.

Item	Oth	Plb	FP	Htg	Elec	Note
Temporary light and power.	p					See General conditions specifications. To accommodate all trades.
Temporary water.	p					
Temporary heat.	p					
Temporary toilets.	p					
Hoisting.					p	
Rigging.					p	
Bracing and dunnage for safe rigging.					p	
Cutting, chasing and patching.	p					Cost where due to late installation or improper coordination of work is the responsibility of electrical contractor.
Framed slots and openings in walls, decks and slabs.	p					Coordination drawings are required from the electrical contractor.
Sleeves through non-waterproof slabs, decks and walls.					p	Includes drilling of holes when required.
Sleeves through waterproof slabs, decks and walls.					p	Includes drilling of holes for other than field poured concrete.
Waterproof sealing of sleeves through waterproof slabs, decks and walls.					p	
Fireproof sealing (fire-stopping) excess opening spaces in slabs, decks and fire-rated walls.					p	
Excavation and backfill inside buildings.	p					
Excavation and backfill outside buildings.					p	

Item	Oth	Plb	FP	Htg	Elec	Note
Concrete encasement of conduits.					p	Red coloring for concrete encasing primary voltage runs included in electric.
Electric manholes and handholes.					p	Furnishing of covers, associated frames and other hardware included in electric.
Fastenings.					p	
Supports.					p	
Flashing of electric conduits through roof (pitch pockets).	p					
Concrete foundations, pads and bases inside buildings.	p					Furnishing of anchors and vibration mounts included in the electric.
Concrete foundations, pads and bases outside buildings.					p	Furnishing of anchors and vibration mounts included in the electric.
Concrete lined trenches in building foundation.	p					
Field touch-up painting of damaged shop coats.					p	
Field rustproof painting of supporting steel members, frames and racks.					p	
Finish painting of exposed work.	p					Red coloring of exposed fire protection alarm systems circuitry included in electric. Red and white striping of exposed primary voltage runs included in electric.
Finished Wall and Ceiling Access Doors and Supporting Frames	p					Supplying list locating all required access doors included in electric.

Item	Oth	Plb	FP	Htg	Elec	Note
Finished Wall and Ceiling Access Doors and Supporting Frames	i				f	Contractor shall locate the doors on approved shop drawings and shall be held responsible for the accessibility of all concealed outlet boxes, pull boxes, controls, equipment, etc.
Permanent catwalks to equipment.	p					Supplying list of locations where required included in electric.
Permanent ladders to equipment.	p					Supplying list of locations where required included in electric.
Opening frames for ceiling recessed lighting fixtures and other electrical items.					p	
Luminous ceilings.	p					Lamp strips and lamps included in electric.
Electric duct heaters (heaters installed in air ducts).				p		Line and control connections included in electric.
Electric heaters with integral fans, (unit heaters, cabinet heaters, fan coil units and the like.)				p		Line and control connections included in electric.
Electric water heaters.		p				Line and control connections included in electric.
Through wall sleeve type air conditioning and electric heating units.					p	
Rubbish removal.					p	Removal of the shipping and packing materials of electrical items is included in the electric regardless by whom the items are furnished.
Special tools for maintenance of equipment furnished as part of electric work.					f	

D. Include in the electrical work all necessary supervision and the issuing of all coordination information to any other trades who are supplying work to accommodate the electrical installations.

E. For items of equipment that are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven in to any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field make-up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all "crown boxes" or other type of termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

F. Items of equipment that are installed but not purchased as part of the electrical work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.8 DEFINITIONS AND INTERPRETATIONS

A. As used in the drawings and specifications for electrical work, certain non-technical words shall be understood to have specific meanings as follows regardless of indications to the contrary in the General Conditions or other documents governing the electric work.

1. "Furnish" – Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the electrical work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased items are free of all liens, claims or encumbrances. Payment of sales taxes is, however, specifically excluded.
2. "Install" – Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the electrical work.
3. "Provide" – "Furnish" and "install."
4. "New" – Manufactured within the past two years and never before used.
5. Regardless of their usage in codes or other industry standards, certain words as used in the drawings or specifications for the electrical work, shall be understood to have the specific meanings ascribed to them in the following list:

a. "Circuitry" – Any electric work (not limited to light and power distribution) that consists of wires, cables, raceways, and/or specialty wiring method assemblies taken all together complete with associated junction boxes, pull boxes, outlet boxes, joints, couplings, splices and connections except where limited to a lesser meaning by specific description.
b. "Wiring" – Same as Circuitry.
c. "Circuit" – Any specific run of circuitry.
d. "Branch Circuit" – Any light and power distribution system circuit that, at its load end, is directly connected to one or more electrical energy consuming items with no overcurrent protection devices interposed, other than (where required) those protecting the energy consuming items from overloading or overheating.
e. "Appliance Panel" – Any panel, used in a light and power distribution system, containing single pole and/or multipole branches rated in various sizes.
f. "Lighting Panel" – Any panel used in a light and power distribution system, having all (or the majority) of its branches single pole and rated the same.
g. "Lighting and Appliance Branch Circuitry" – All or any portion of branch circuits outgoing from a lighting or appliance panel.
h. "Feeder" – Any item of light and power circuitry used in a distribution system that is not lighting and appliance branch circuitry.
i. "Main Feeder" – Any feeder that, at its supply end, is connected through its own overcurrent protection (and switching) device, and none other, directly to a main service or a main service overcurrent protection (and switching) device.
j. "Branch Feeder" – A feeder, other than a main feeder, that complies with the definition of a branch circuit.
k. "Submain Feeder" – Any feeder that is neither a main feeder nor a branch feeder.
l. "Distribution Panel" – Any panel, used in a light and power distribution system, containing only multi-pole branches and with all (or the majority) of its branches used for feeders supplying other panels.
m. "Power Panel" – Same as distribution panel, except with all (or the majority) of its branches used for feeders that do not supply other panels.
n. "Motor Power Circuit" – Any circuit that operates nominally at 100 volts or more, and that carries electrical input energy to a motor.
o. "Motor Control Circuit" (used in conjunction with a motor for which a magnetic starter is supplied) – Any circuit (other than a motor power circuit) that operates nominally at 100 volts or more, and that carries current intended for directing or indicating the performance of a motor starter.
p. "Motor Control Circuit" (used in conjunction with a motor for which a manual starter is supplied) – Any circuit containing an extension of power circuit wires, other than those constituting the direct connection between source of supply, starter and motor.
q. "Motor Control Actuating Device" – Any device that performs a switching function in a motor control circuit (pushbuttons, automatic contacting devices, etc.).
r. "Motor Control Actuated Device" – Any device that functions in response to voltage received from a motor control circuit (pilot lights, solenoids, etc.)
s. "Package Unit" – An item of equipment having one or more motors or other electric energy consuming elements integrally factory mounted on a single base, complete with all associated control devices and interconnecting wiring.
t. "Low Voltage" – Below 50 volts.
u. "Process Control System" – An overall control and/or logging system available as a "package" from specialty manufacturers (commonly referred to as a "Temperature Control System" or an "Automatic Control System" or a "Building Management System").
v. "Grade Slab" – A building floor slab that is in contact with or directly over grade (earth).

w. "Building Confines" – The extent of a building, as defined by the outside surfaces of its peripheral walls, the top surface of its roof, and the underside surface of its grade slab.
x. "Distribution Switch" – Any switch used in a light and power system other than a tumbler, toggle or specialty switch in the "wiring device" category.
y. "Normal Electric Work Conditions" – Locations within building confines that are neither damp, wet nor hazardous and that are not used for air handling.
z. "Underground" – Subsurface and exterior to building foundations.
aa. "At Underside of Grade Slab" – Under a grade slab and integrated into it.
bb. "Below Grade Slab" – Under a grade slab but not integrated into it.
cc. "Standard" (as applied to wiring devices) –- Not of a separately designated individual type.
dd. "Raceway" – Any pipe, duct, extended enclosure, or conduit (as specified for a particular system) that is used to contain wires, and that is of such nature as to require that the wires be installed by a "pulling in" procedure.
ee. "Subject to Mechanical Damage" – Exposed within seven feet of the floor in mechanical rooms, vehicular spaces, or other spaces where heavy items (over 100 pounds) are moved around or rigged as a common practice or as required for replacement purposes.

B. The following shall be treated as damp or wet locations within building confines, regardless of whether or not a high ambient moisture level is found to exist:

1. Spaces where any designations indicating weatherproof (WP) or vapor-proof (VP) appear on the drawings.
2. Below waterproofing in slabs applied directly on grade.
3. Kitchens up to a height of 18" above finished floor.
4. Outside of waterproofing in foundation walls in contact with grade.
5. Above waterproofing in slabs having no building above.
6. Above waterproofing in fill on slabs having no building above.
7. Spaces containing equipment owned and/or maintained by the electric utility company.

C. Electric work in slabs, walls or suspended ceilings that bound on a space defined as a damp or wet location shall meet the damp or wet location requirements if it enters into, or opens into the damp or wet location in any way.

D. Where the word "conduit" is used without specific reference to type, it shall be understood to mean "raceway".

E. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings and specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work regardless of whether or not this instruction is explicitly stated.

F. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.

G. To the extent that they govern the basic work, the specifications also govern change order work if any.

H. No exclusion from or limitation in, the symbolism used on the drawings for electrical work or the language used in the specifications for electrical work shall be interpreted as a reason for omitting the appurtenances or accessories necessary to complete any required system or item of equipment.

I. The drawings for electrical work utilize symbols and schematic diagrams that have no dimensional significance. The work shall, therefore, be installed to fulfill the diagrammatic intent expressed on the electrical drawings, but in conformity with the dimensions indicated on the final working drawings, field layouts and shop drawings of all trades. In particular, information as to the exact size, location and electrical connection points for mechanical equipment shall be derived by reference to HVAC and Plumbing documents.

J. Certain details appear on the drawings for electrical work that are specific with regard to the dimensioning and positioning of the work. These are intended only for general information purposes. They do not obviate field coordination for individual items of the indicated work.

K. Information as to general construction and architectural general construction and architectural features and finishes shall be derived from structural and architectural drawings and specifications only.

L. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

M. Ratings of devices, materials and equipment specified without reference to specific performance criteria shall be understood to be nominal or nameplate ratings established by means of industry standard procedures.

N. The restriction of conductors in wires to copper, as specified elsewhere, shall be understood to also apply to all conductors (wire, cable or bus as applicable), including those provided as part of factory assembled components such as switchboards, panelboards, overcurrent protection and switching devices. This restriction shall apply equally to all such equipment regardless of indications (or lack thereof) elsewhere to the contrary. Aluminum will not be acceptable.

1.9 PRECONSTRUCTION CONFERENCE PRIOR TO START OF WORK

A. Prior to commencing any Work, the CM, together with designated major Contractors, shall confer with the Contracting Officer concerning the Work under the Construction Contract.

B. The pre-construction conference will be conducted under the leadership of the CM and will occur soon after the CM notifies the Subcontractors of contract award. The pre-construction conference will focus on items such as the expedited submittal review procedure, interface and coordination between Contractor work scope, the CM's project site rules and requirements, temporary utility requirements, CM's construction schedule, etc.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of mechanical services.

F. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where electrical items requiring access are concealed behind finished surfaces. See paragraph titled “Separation of Work Between Trades” to determine whether access panels and doors the responsibility of the Contractor for Division 08 or the Contractor responsible for Division 26

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS (Not Included)

PART 3 - EXECUTION

3.1 ELECTRICAL INSTALLATIONS

A. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

B. Locations of all devices, fixtures, and other visible components shall be as indicated on the architectural drawings. Mounting heights shall be as specified in Division 26 Section “Raceways and Boxes”.

C. Each piece of mechanical equipment located outside the building or on the roof shall be within 25 feet of a duplex receptacle. Where necessary to meet these criteria, provide duplex receptacles in addition to those devices shown on the drawings. Each shall be complete with waterproof cover and integral GFI protection, and 20 ampere circuitry to the nearest 120 volt panel.

D. Provide a duplex receptacle in each room containing switchgear, switchboards, panelboards. Where necessary to meet these criteria, provide duplex receptacles in addition to those devices shown on the drawings. Each shall be complete with 20 ampere circuitry to the nearest 120 volt panel not served from the equipment within the room (other than for service equipment).

3.2 SITE VISITATION SURVEYS AND MEASUREMENTS

A. All existing conditions cannot be completely detailed on the drawings. These include, but are not limited to conduit, equipment, etc. This contractor shall survey the site and include all required costs in making up their bid proposal.

B. The contractor shall visit the premises to determine existing conditions and compare same with drawings and specifications and satisfy himself of all conditions prior to the submission of a bid proposal. No allowance will be made for failure to comply with these requirements and a bid proposal shall be construed as evidence he has done so.

C. Before submitting bid, visit the project site to satisfy yourself that all equipment shown or specified in the project contract documents can be installed generally as shown. Advise Government prior to bid date, of any space or other installation problems.

D. Before submitting bid, become thoroughly familiar with all conditions under which work will be installed, as you will be held responsible for any assumptions, any omissions or errors made as a result of failure to become familiar with the site and Contract Documents.

E. Investigate each space through which equipment must be moved. Where necessary, equipment shall be shipped from manufacturer in sections of size suitable for moving through restrictive spaces available. Ascertain from Government at what time of day equipment may be moved through certain restrictive areas.

F. Install work so as to be readily accessible for operation, maintenance and repair. Minor deviations from drawings may be made to accomplish this, but changes which involve extra cost shall not be made without approval.

G. Removal and relocation of certain existing work will be necessary for the performance of the general work. All existing conditions cannot be completely detailed on the drawings. The Contractor shall survey the site and include all required changes in making up their bid proposal.

H. Submission of a bid shall be construed as evidence, that a careful examination of the portions of the existing building, equipment, etc., which affect this work and the access to such spaces has been made and that the Contractor is familiar with existing conditions and difficulties that will affect the execution of the work. Claims will not be allowed for labor, equipment or materials required because of difficulties encountered, which could have been foreseen during such an examination.

3.3 ELECTRICAL DEMOLITION

A. Comply with requirements of Division 02 titled “Existing Conditions”

B. This contractor shall provide all required labor, materials, equipment and perform all operations for complete demolition, removal and relocation of the existing work as indicated on the drawings and/or as specified or described and/or as required for the performance of the general work under this contract.

C. The project contains existing electrical installations. Integrate the existing installations into the overall project as described below.

D. Except for items specifically indicated as being reused, completely abandon existing electrical work by:

1. De-energizing it and/or cutting it loose from every live source.
2. Cutting away all exposed portions and any concealed portions that create interferences with the new installations of the various trades working at the project.
3. Removing all existing wires and cables from existing raceways that remain.

E. No portion of existing electrical installations shall be used to make up any of the required electrical work except as follows:

1. Raceways with associated junction boxes and pull boxes) only for service as specifically indicated.

F. Unless otherwise specifically specified, include all cutting and patching of existing floors, walls, partitions and other materials in the existing building. The Contractor shall restore these areas to original conditions.

G. Specifications pertaining to equipment and devices, hereinafter included, apply to new work. Where it is required that items be made up with components that are both new and existing, it shall be interpreted that the specifications govern only as they are applicable to new components.

H. Outages of existing electrical systems necessitated by the new construction work of all trades shall be in accordance with a schedule issued in the field by the Contracting Officer. Include all electric work, overtime labor and supervision necessary to adhere to this schedule.

I. Any existing electrical work that is pulled out or cut away in compliance with the above requirements shall be removed from the site as if it were rubbish. Proper credit shall be given for all salvageable items.

J. During demolition procedures, provide all necessary protection for existing electric work required for reuse.

K. Remove all low voltage (audio, data, Class 2, Class 3, PTLC, fire alarm, optical fiber, communications, coaxial, and network) cables that are abandoned.

3.4 CONNECTIONS TO EXISTING WORK

A. Plan installation of new work and connections to existing work to ensure minimum interference with regular operation of existing facilities. Submit to the Government for approval, date schedule of necessary temporary shut-downs of existing services. All shutdowns shall be made at such times as will not interfere with regular operation of existing facilities and only after written approval of Government. To ensure continuous operation, make necessary temporary connections between new and existing work. All costs resulting from temporary shut-downs shall be borne by this Contractor.

3.5 REFINISHING AND TOUCH UP PAINTING

A. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

C. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

D. Repair damage to PVC or paint finishes with matching touch up coating recommended by manufacturer.

3.6 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Cutting and patching for electrical construction.
2. Touch up painting.

3.7 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70 as amended by state and local codes.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems; Atkore Inc. Company
2. Encore Wire

3. General Cable Corporation.
4. Lifeline brand MC; Prysmian Group company (2-hour fire resistance rated MC Power Cable)
5. Pyrotenax System 1850 MI Cable; by nVent
6. Southwire Company.
7. Stabiloy Brand, a Prysmian Group company (Aluminum conductors)
8. TEC MICC MI Cable (2-hour fire resistance rated cable)
9. VITALink Type MC (2 hour fire resistance rated MC Power Cable)

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70.

D. Multiconductor Cable: Comply with NEMA WC 70.

E. Type AC cables shall comply with the following:

1. Where used as the wiring method for branch circuit runs, each cable shall incorporate a separate green insulated ground conductor sized equal to the phase conductors.

F. Type MC cable shall have 90 degree C insulation and shall be UL listed as type "MC".

G. Type MC cable shall comply with the following:

1. Each cable shall incorporate a separate green insulated ground conductor sized equal to the phase conductors.
2. Where used as the wiring method for branch circuit runs that have been specified elsewhere (or called for on the drawings) as requiring a ground wire, e.g., for electronic equipment and/or for landscape furniture systems, each cable shall incorporate a separate green insulated ground conductor sized equal to the phase conductors.

H. When substituting aluminum conductors, comply with the following:

1. Exclude aluminum conductors for feeders where the use of such conductors would cause raceway sizes to exceed the limits permitted for embedment in concrete or otherwise set by the space conditions.

I. In general, cable ampacities are based on a 60 degree C rating for cables #1 AWG and smaller and on a 75 degree C rating for larger cables. In conjunction with this, note the following:

1. 75 degree C ratings may be utilized for cables #1 AWG and smaller where overcurrent protection and switching devices (OCD's), wiring devices and solidly connected equipment connected to such cables are listed and identified for use with 75 degree C rated conductors. (Note that these specifications require all OCD's - regardless of ampere rating to be suitable for use with 75 degree C rated conductors).
2. Increase indicated cable (and raceway) sizing as required for circuitry where conductors #1 AWG and smaller will connect directly to solidly connected utilization equipment whose load current will exceed the 60 degree C rating of the cable, and for which manufacturer's approval for cable terminations is less than 75 degrees C, or to receptacles whose ampere rating exceeds the 60 degree C rating of the connected cables unless such receptacles are listed for use with 75 degree C rated conductors. Note that accessible intermediate tap boxes may be utilized adjacent to 60 degree C rated terminations to allow conductor "upsizing" locally so as to comply with such termination requirements.

3. Increase indicated cable (and raceway) sizing as required for circuitry where conductors are run in conduits exposed to direct sunlight on or above rooftops in accordance with the temperature adjustment factors described in the electrical code. Conductors shall be Type XHHW-2.

J. For low voltage systems where circuits are power limited in accordance with Class 2 or Class 3 requirements (as defined in Article 725 of the National Electrical Code) utilize cables having characteristics as follows:

1. Cable shall be U.L. listed type CL3 except that where run in hung ceilings or raised floors used as air handling spaces or where run from floor to floor, they shall be of a fluoropolymer installed type U.L. listed as type CL3P or CMP. Where run in cable trays they shall be U.L. listed type PLTC, except type CMP where trays are run in plenums.

K. For low voltage systems whose circuits are not power limited Class 2 or Class 3 (in accordance with the requirements of Article 725 of the National Electrical Code), and that are not telecommunications circuitry (in accordance with Article 800 thereof), utilize copper conductors having TFN insulation for sizes #16 AWG and smaller, and type THHN or THWN for sizes #14 AWG and larger. Wires shall be run in electric metallic tubing.

L. For low voltage circuits intended for the distribution of voice or data utilize communications cables (complying with requirements of Article 800 of the National Electrical Code) having characteristics as follows:

1. Cable shall be U.L. listed type CM except that where run in hung ceilings or raised floors used as air handling spaces or where run from floor to floor, they shall be U.L. listed as type CL3P or CMP or CMR respectively. Where run in cable trays, they shall be U.L. listed type PLTC, except they shall be type CMP where trays are run in plenums.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: [Type THHN-THWN, single conductors in raceway][Type XHHW, single conductors in raceway].

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

F. Exposed Branch Circuits[, Including in Crawlspaces]: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

I. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway or Armored cable, Type AC or Metal-clad cable, Type MC.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

K. Class 1 Control Circuits: Type THHN-THWN, in raceway.

L. Class 2 Control Circuits: Type THHN-THWN, in raceway or Power-limited cable, concealed in building finishes.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Install MI and 2 hour rated MC power cables in accordance with the manufacturer's recommendations, the UL product listing requirements, and the following:

1. For feeders and circuitry that are specified to include a ground conductor, provide a separate ground conductor sized as required by the electrical code. For MI cable this shall be a separate MI conductor. For 2 hour rated MC cable this shall be a separate conductor within the cable.
2. Where MI cables terminate or pass through a ferrous enclosure, remove a portion of the enclosure and provide a non-ferrous brass plate.
3. Splices of MC 2-hour fire rated cable shall be made within a 2 hour rated enclosure.
4. Cables shall comply with termination temperature ratings as specified hereinafter.
5. Where required in order to comply with code restrictions on allowable voltage drop, increase the conductor size and/or add parallel sets of conductors, as required to limit the voltage drop to the point of final distribution to the code mandated maximum voltage drop. Add parallel conductors if the maximum available conductor size will not sufficiently limit the voltage drop.

6. Where installed in accordance with the above, and with the manufacturer's requirements and electrical code requirements for free air installation, the free air rating of the cable may be used. Provide calculations to demonstrate compliance with the requirements above.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.5 FIREPROOFING WIRES AND CABLES:

A. Beyond the termination of raceways, apply fireproofing over the unprotected insulation.

3.6 INSTALLATION OF CIRCUITRY FOR MISCELLANEOUS LOW VOLTAGE SYSTEMS:

A. Comply with requirements described in applicable subsections of this Section. In particular, note the following circuitry requirements for low voltage systems:

1. Wiring for miscellaneous low voltage systems may be run without conduit - subject to the approval of the local authorities - except where prohibited by other sections of these specifications or by indications on the drawings.
2. Where conduit is required, it shall be steel electric metallic tubing (EMT), except that it shall be galvanized intermediate steel conduit where located within 8 feet of the floor in mechanical spaces (or is otherwise exposed to mechanical damage).
3. Wires and cables shall have characteristics - in compliance with Articles 725 and/or 800 (as applicable) of the National Electrical Code - as described elsewhere in the specifications or drawings for this project, and shall be U.L. listed in accordance therewith.
4. Where wires and cables are permitted to be run without conduit, they shall be independently supported from the building structure or ceiling suspension systems at intervals not exceeding four feet on center, utilizing cable supports specifically approved for the purpose. Wires and cables shall not rest on or depend on support from suspended ceiling media (tiles, lath, plaster, as well as splines, runners or bars in the plane of the ceiling), nor shall they be supported from pipes, ducts or conduits. Where cables are bundled together, separate bundles shall be provided separately for each type of cabling and separately for each independent system. Bundling and/or supporting ties shall be of a type suitable for use in a ceiling air handling plenum regardless of whether or not installed in a plenum.
5. Cables shall be tagged or labeled at each termination point and in each intermediate junction box, pull box or cabinet through that they pass.
6. Comply with applicable requirements for locating and routing circuitry, for installing circuitry, and for fire-stopping as described in other sub-section of this Section.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 2 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Ground plates.
5. Grounding arrangements and connections for separately derived systems.
6. Grounding for sensitive electronic equipment.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

D. Comply with NFPA 70, as amended by state and local codes.

E. Comply with applicable BICSI standards.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. For insulated conductors, comply with Division 26 section Low-Voltage Electrical Power Conductors and Cables".

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

E. Grounding Electrode Conductors: Stranded cable.

F. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

G. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 ft in length.

B. Plate Electrodes: Copper plates, minimum 0.10 inch thick, 24 inch square.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Electrode: Install bare tinned-copper conductor, No. 3/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (will extnd above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.3 EQUIPMENT GROUNDING

A. Equipment Grounding Conductor Application: Comply with NFPA 70, as amended by state and local codes, for sizes and quantities of equipment grounding conductors except where specific types, larger sizes, or more conductors are indicated.

B. Install insulated equipment grounding conductors with all feeders and branch circuits.

C. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, antenna, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

D. The neutral bar of each individually enclosed service switch shall be bonded to its enclosure on the line side of a removable link (included therein), and connected to the main grounding electrode by means of insulated grounding electrode conductors run in intermediate metallic conduit and sized as per Code.

E. Bonding jumpers shall be applied where wiring devices (receptacles and switches) are not equipped with approved self-grounding features. Include any necessary field modifications for termination of the bonding jumpers so as to ensure grounding continuity.

F. Bonding jumpers shall be applied to ensure that grounding continuity does not depend solely on the supporting screws fastening metallic enclosures together.

G. Include any necessary field modifications for termination of the bonding jumpers so as to ensure grounding continuity.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

Where specifically noted on the drawings, or described hereinbefore in this Section, include insulated equipment and raceway grounding conductors run within the raceways. Where insulated equipment grounding conductors required for feeders have not been included in the quantities of conductors indicated on the drawings, incorporate such conductors in accordance with the electrical code. Adjust conduit sizing if required.

3.5 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at ground test wells. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System: 5 ohms.

2. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Contracting Officer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.

4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70 as amended by State and Local Codes.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. U-Channel Systems: 16-gauge steel channels, with 9/16-inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps] single-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

E. Raceway Supports: Comply with the following requirements:

1. Conform to manufacturer's recommendations for selection and installation of supports.
2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4 inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on conductor terminals.

F. Vertical Conductor Supports: Install simultaneously with installation of conductors.

G. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

H. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.

I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cabinets, panelboards, boxes, disconnect switches, and control components in accordance with the following:

1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

J. In general, walls and partitions are not suitable for supporting the weight of panelboards and the like. Include supporting frames or racks extending from floor slab to ceiling slab for all such items unless specifically instructed otherwise by the Contracting Officer.

K. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.

L. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

M. No work intended for exposed installation in damp locations is mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4 inch air space between the building surfaces and the work.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. All equipment shall be provided with foundations.

B. Furnish shop drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports, and all required anchor bolts and other appurtenances necessary for the proper installation of this equipment. All concrete work shall be shown in detail on the shop drawings, prepared by this trade.

C. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

D. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete." and Section 033053 "Miscellaneous Cast-in-Place Concrete."

E. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 GROUT

A. Install nonmetallic nonshrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

B. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

C. Clean surfaces that will come into contact with grout.

D. Provide forms for placement of grout, as required.

E. Avoid air entrapment when placing grout.

F. Place grout to completely fill equipment bases.

G. Place grout on concrete bases to provide a smooth bearing surface for equipment.

H. Place grout around anchors.

I. Cure placed grout according to manufacturer's printed instructions.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. GRC: Galvanized rigid steel conduit.

C. RNC: Rigid nonmetallic conduit. Generic term that includes PVC and RTRC conduits.

D. IMC: Intermediate metal conduit.

E. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For **[**wireways and fittings, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc., a brand of Atcore International
2. Allied Tube & Conduit; a brand of Atcore international
3. Anamet Electrical, Inc. (Flexible metallic conduits only)
4. Electri-Flex Company. (Flexible metallic conduits only)
5. O-Z/Gedney; a brand of Emerson
6. Picoma Industries, a Division of Zekelman Industries
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation, a division of Zekelman Industries
12. Wheatland Tube Company; a division of Zekelman Industries

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: die cast.
b. Type: compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc., a brand of Atcore International
2. Arnco Corporation.
3. CANTEX Inc.

4. CertainTeed Corp.
5. Condux International, Inc.
6. Kraloy.
7. Lamson & Sessions; Carlon Electrical Products.
8. Niedax-Kleinhuis USA, Inc.
9. RACO; a Hubbell company.
10. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. PVC: Type complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. RTRC: Comply with UL 1684A and NEMA TC14.

F. LFNC: Comply with UL 1660.

G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, or Type 4 as applicable, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Contracting Officer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Mono-Systems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Contracting Officer from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell Incorporated; Wiring Device-Kellems Division.
b. Mono-Systems, Inc.
c. Panduit Corp.
d. Wiremold / Legrand.

D. Tele-Power Poles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Mono-Systems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2. Material: Aluminum with clear anodized finish.
3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.

11. O-Z/Gedney; a brand of EGS Electrical Group.
12. RACO; a Hubbell Company.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy except us aluminum with ARC, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, **[round] [rectangular]**.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron except use cast aluminum with ARC, with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep or 4 inches by 2-1/8 inches by 2-1/8 inches deep or deeper as required to accommodate wiring devices.

M. Gangable boxes are prohibited.

N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, or Type 4 as applicable with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: **[Plastic] [Fiberglass]**.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:

1. NEMA 250, Type 1 or Type 3R as applicable galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carson, brand of Oldcastle Infrastructure, a CRH Company
b. NewBasis.
c. Nordic Fiberglass, Inc.

2. Standard: Comply with ANSI/SCTE 77.
3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC" or to match service contained.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with ANSI/SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.
2. Concealed Conduit, Aboveground: GRC or IMC.
3. Underground Conduit: RTRC, Type EPC-80-PVC, **[direct buried] [in concrete duct bank]**.
4. **[PVC conduits shall not be used for Con Edison service wiring]**

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed in dry location and not Subject to Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following up to 8'-0" above finished floor:

   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Parking garage areas.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Embedded in concrete slab**.**
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

E. Install surface raceways only where indicated on Drawings.

1. The following shall be interpreted as being "hazardous" locations regardless of actual condition of atmospheric contamination.

   a. The volume included between the floor and a height of 48 inches above the floor throughout all space designated for parking, including all associated above grade vehicular ramps and access ways, and all spaces on the floor not separated from the parking space by partitions.
   b. The entire floor to ceiling volume of all spaces designated for the storage of flammable anesthetics.
   c. The volume included between the floor and a height of 60 inches above the floor throughout all spaces designated for the administration of flammable anesthetics.
   d. The entire interior volume of any paint spray booth and its associated ductwork.
   e. The entire volume of any space falling within 20 feet of the open face of any paint spray booth, and which is not cut off by air tight, unpierced walls, partitions, slabs or other general construction elements.

f. The entire floor to ceiling volume of any space designated for painting by means of open spraying or tank dipping.
g. Electric work located in slabs, walls or suspended ceilings which bound on a space defined as a hazardous location shall meet the hazardous location requirements if it enters into, or opens into, the hazardous location in any way.

2. The following shall be treated as damp or wet locations within building confines, regardless of whether or not a high ambient moisture level is found to exist:

a. Spaces where any designations indicating weatherproof (WP) or vaporproof (VP) appear on the drawings.
b. Parking garage areas where open to exterior.
c. Loading docks.
d. Cooling tower areas.
e. Below waterproofing in slabs applied directly on grade.
f. Kitchens up to a height of 18 inches above finished floor.
g. Outside of waterproofing in foundation walls in contact with grade.
h. Above waterproofing in slabs having no building above.
i. Above waterproofing in fill on slabs having no building above.
j. Spaces containing equipment owned and/or maintained by the electric utility company.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Install temporary closures to prevent foreign matter from entering raceway.

F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

I. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Use insulating bushings to protect conductors.

J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Raceways Embedded in Slabs:

1. Run raceway larger than 1 inch (DN 27) trade size parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place raceway close to slab support.

O. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or GRC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install the locknuts with dished part against the box. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

W. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

X. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations.
2. Install separate ground conductor across flexible connections.

3.3 INSTALLING JUNCTION, PULL AND OUTLET BOXES:

A. Apply junction and pull boxes in accordance with the following:

1. Include pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.
2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.
3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.
4. Where the wires and cables following the same routing are indicated as running through separate pull boxes, it shall be understood that a segregation of the wires and cables is required. Separately indicated pull boxes may be incorporated into single boxes on condition that segregation is maintained by barriers of the type hereinafter specified.
5. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).

B. Apply outlet boxes in accordance with the following:

1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein unless they are specifically rated to accept "through circuit" building wires.
2. A continuous row of fixtures of the end-to-end channel type, designed for "through wiring," and wired in accordance with the specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
3. A series of separate fixtures, designed for "through wiring," spaced not more than 2 feet apart, and interconnected with conduit or raceway and circuitry which is in accordance with the specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one, but not more than four, such fixtures are connected into a single outlet box. When adopting this procedure:

    a. Utilize an outlet box no smaller than 4-11/16 inches square by 2-1/8 inches deep.
    b. Allow no fixture to be supplied from an outlet box in another room.

5. Multiple local switches indicated at a single location shall be gang mounted in a single outlet box.
6. Include all required outlet boxes regardless of indications on the drawings (which due to symbolic methods of notation, may omit to show some of them).
7. Regardless of any indications on the drawings, flush wall mounted outlet boxes shall not be set back-to-back in fire rated walls or partitions, even if they are displaced vertically. Such outlets shall be offset horizontally by 24 inches or as otherwise required to maintain the fire rating.

C. Install junction boxes, pull boxes and outlet boxes in accordance with the following:

1. Exclude surface mounted outlet boxes in conjunction with concealed circuitry.
2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.
3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.
4. Pack "through the wall" collar type outlet boxes with a sound deadening, non-hardening, non-hygroscopic, non- combustible, high dielectric stuffing material manufactured specifically for the purpose.
5. Outlet boxes for switches shall be located at the strike side of doors. Indicated door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
6. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
7. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.

D. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.

E. Barriers in junction and pull boxes which are larger than outlet size shall be of polyester resin fiberglass of adequate thickness for mechanical strength but in no case less than 1/4 inch. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.4 MOUNTING HEIGHTS:

A. Heights of all wall mounted outlets and equipment shall be in accordance with the following list. (Dimensions are above finished floor unless noted.)

1. Receptacle or telephone outlet in field constructed wall, partition or column unless otherwise specified below -- 18 inches to centerline.
2. Receptacle or telephone outlet in mechanical spaces, electric switchboard rooms, electric closets -- 60 inches to centerline.
3. Toggle switch outlet in field constructed wall partition or column -- 46 inches to centerline.

B. Architectural drawings and field instructions issued by the Contracting Officer take precedence over the above list and shall be adhered to.

C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

E. Locate boxes so that cover or plate will not span different building finishes.

F. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

G. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

H. Set metal floor boxes level and flush with finished floor surface.

I. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless Steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70 as amended by State and Local Codes.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

G. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

1. Overall Thickness: 5 mils.
2. Foil Core Thickness: 0.35 mil.
3. Weight: 28 lb/1000 sq. ft.
4. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 48 INCHES." Adjust clearance dimensions as required for system voltage and equipment configuration.
3. Arc Flash Warning: “POTENTIAL ARC FLASH HAZARD - APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT AND TOOLS REQUIRED WHEN WORKING ON THIS EQUIPMENT.”

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less:

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

B. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags or self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

C. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes or self-adhesive, self-laminating polyester labels with the conductor designation.

D. Ground fault interrupter outlets: Identify receptacles supplied by ground fault interrupter circuit breakers or by upstream ground fault interrupter receptacles. Use engraved letters on device plate.

E. Automatically controlled outlets: Identify receptacles controlled by automatic controls (time switch, occupancy sensor, etc.) with the "controlled receptacle marking symbol" engraved into the device plate.

F. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source and circuit number.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

5. Service equipment shall be labeled with the maximum available fault current. Label shall indicate date fault current calculation was performed.
6. Switchboards, Panelboards, Equipment Control Panels, Meter Socket Enclosures, and Motor Control Centers: Labeled to warn of potential electric arc flash hazards. The label shall be located so as to be clearly visible before examination, adjustment, servicing, or maintenance of the equipment.

K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

L. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

M. Power Source Identification Labels: On each switchboard, switchgear, or panelboard install label to identify the source of power supply and its physical location.

N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.

END OF SECTION

SECTION 260573

OVERCURRENT PROTECTIVE DEVICE COORDINATION AND ARC FLASH HAZARD ASSESSMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes computer-based, fault-current and overcurrent protective device coordination, including ground fault studies and the setting of these devices. Protective devices shall be set based on results of the protective device coordination study.

1. Coordination of series-rated devices is permitted except where fully rated systems are required.

B. The arc flash hazard assessment shall be in compliance with the applicable standards for installations (NEC) and for worker safety in operating facilities (OSHA 29 CFR 1910, NFPA 70E-2018).

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

B. Related Section: The following Sections contain requirements that relate to this Section:

1. Section 26 05 00 “Common Work Results for Electrical”.
2. Section 26 28 02 “Selection of Overcurrent”.
3. Section 26 28 13 “Fuses”.

1.3 SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Other Action Submittals:

1. Coordination-study input data, including completed computer program input data sheets.
2. Coordination-study report.
3. Equipment evaluation report.
4. Setting report, including setting tables.
5. Flash hazard analysis.
6. Recommendations.

1.4 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

E. Comply with NFPA 70 as amended by state and local codes.

F. Comply with NFPA 70E for flash hazard analysis.

G. IEEE 1584 guide for performing arc-flash hazard calculations.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:

1. CYME International, part of Eaton.
2. EDSA Micro Corporation.
3. ETAP
4. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399, Table 7-4.

C. Computer software program shall be capable of plotting and diagraming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer generated time-current plots.

1. Required Features: Arcing faults NFPA 70E.
2. Optional Features: Simultaneous faults.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance.

B. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices not submitted for approval with coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical distribution system diagram showing the following:

    a. Load current that is the basis for sizing continuous ratings of circuits for cables and equipment.
    b. Circuit-breaker and fuse-current ratings and types.
    c. Relays and associated power and current transformer ratings and ratios.
    d. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    e. Generator kilovolt amperes, size rating, impedance, and reactance.
    f. Cables. Indicate conduit material, sizes of conductors, conductor material, conductor insulation, and length.
    g. Busway ampacity and impedance.
    h. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Magnetic inrush current overload capabilities of transformers.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes RMS symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes RMS symmetrical.

3.3 FAULT-CURRENT STUDY

A. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project and use approved computer software program to calculate values.

B. Calculate momentary and interrupting duties on the basis of maximum available fault current.

C. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with the following:

1. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.
2. Low-Voltage Fuses: IEEE C37.46.
3. Medium-Voltage Circuit Breakers: IEEE C37.010.
4. Medium-Voltage Fuses: ANSI C37.40

D. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (½-cycle) fault currents on the report electrical distribution system diagram.

E. Equipment Evaluation Report: Prepare a report on the adequacy of overcurrent protective devices by comparing fault-current ratings of these devices with calculated fault-currents. Recommend settings as required.

1. For low-voltage (600V and below) overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated ½-cycle symmetrical fault current.
2. For devices and equipment rated for symmetrical fault current, apply multiplication factors listed in the standards to ½- cycle fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated ½ -cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study and prepare a written report using the results of fault-current study and approved computer software program. Comply with IEEE 399.

1. Calculate the maximum and minimum ½ -cycle short-circuit currents.

B. Comply with IEEE 242 (Buff Book) recommendations for fault currents and time intervals.

C. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Verify adequacy of phase conductors at maximum three-phase bolted fault currents, equipment grounding conductors, and grounding electrode conductors at maximum ground-fault currents.

D. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.
b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
d. Fuse-current rating and type.
e. Ground-fault relay-pickup and time-delay settings.

3.5 ARC FLASH STUDY

A. An incident energy study shall be done in accordance with the IEEE 1584-2018, “IEEE Guide for Performing Arc Flash Hazard Calculations” as referenced in NFPA 70E, “Standard for Electrical Safety in the Workplace”, 2018 Revision, in order to quantify the hazard for selection of personal protection equipment (PPE). Tables that assume fault current levels and clearing time for proper PPE selection are not acceptable.

B. Incident energy report: Incident energy level (calories/cm2) for each equipment location and recommended PPE.

C. Labels: Based on the results of the incident energy study, produce and install a warning label (orange <40 cal/cm2) or danger label (red >40 cal/cm2) for each piece of electrical equipment in accordance with ANSI Z535.4-2011 (R2017). The label must be readable in both indoor and outdoor environments for at least 3 years and contain the following information:

1. Arc hazard boundary (inches)
2. Working distance (inches)
3. Arc flash incident energy at the working distance (calories/cm2)
4. PPE category and description including the glove rating.
5. Voltage rating of the equipment.
6. Limited approach distance (inches)
7. Restricted approach distance (inches)
8. Prohibited approach distance (inches)
9. Equipment/bus name
10. Date prepared
11. Name and address

D. Safety training: Provide one day of arc flash training that contains the requirements referenced in OSHA 1910.269, OSHA 1910 Subpart S and NFPA 70E. This shall include:

1. Proper use of the system analysis data
2. Interpretation of the hazard labels
3. Selection and utilization of personal protective equipment
4. Safe work and practices and procedures
5. Provide an outline of the one day training course including training materials at time of quotation.

END OF SECTION

SECTION 262001

FEEDERS AND BRANCH CIRCUITRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes basic requirements for the installation of light and power feeders and circuitry run at less than 600 volts.

B. Related Requirements:

1. Division 26, Section "Raceways and Boxes."
2. Division 26, Section "Conductors and Cables."
3. Division 26, Section "Panelboards."

1.3 ACTION SUBMITTALS

A. Shop Drawings:

1. Circuited up "as-built" drawings and panel directories as called for in the Division 26 related sections.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70, as amended by state and local codes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products shall be as specified in the Division 26 related sections.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING AND APPLIANCE BRANCH CIRCUITRY

A. Circuitry indicated without sizing shall be understood to be lighting and appliance branch circuitry protected at 20 amps or less.

B. Conform all lighting and appliance branch circuitry (regardless of whether protected above or below 20 amps) to the following:

1. Except as noted below, circuitry shall be multi-wire utilizing common neutrals arranged so that no neutral conductor acts as a common wire for more than one circuit conductor connected to the same phase leg of the supply system.

a. Common neutrals shall not be utilized for circuitry runs emanating from panel branches having ground fault interrupting features regardless of any indication to the contrary on the floor plans.

2. Branch circuitry supplying relay controlled lighting fixtures shall be understood to include all necessary interconnections between the control panels containing the relays and the associated lighting or appliance panels.
3. Under no condition shall any local switch break a neutral conductor.
4. At any location where lighting and appliance branch circuitry is extended from a flush mounted panelboard to a suspended ceiling immediately above, at least four 1-inch empty conduits shall be included (in addition to those required for active circuitry) to permit future wiring escape from the panelboard. The empty conduits shall extend up from the panel and shall terminate in a threaded conduit cap immediately after turning out into the hung ceiling space.
5. Raceway sizes shall conform to standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

C. Conform lighting and appliance branch circuitry, indicated as being protected at 20 amps or less, to the following:

1. 120 volt circuitry shall be supplied from 20 amp panel branches except as indicated, and as noted below:

a. Circuitry supplying multi-outlet receptacle circuits shall be connected to 15 amp panel branches unless otherwise noted or specified hereinafter.

2. Except as specified below, minimum conductor size shall be #12 AWG.
3. Common neutrals shall not be utilized for circuitry runs containing more than three (3) 120 volt receptacle circuits within a single raceway (conduit).
4. Conductors for 120 volt circuitry extending in excess of 75 feet, from the point of supply, to the first outlet shall be #10 AWG (minimum) copper to the first outlet. Increase beyond #10 AWG if required for compliance with code-mandated voltage drop restrictions.
5. Conductors for 277 (265) volt circuitry extending in excess of 150 feet, from the point of supply, to the first outlet shall be #10 AWG (minimum) copper to the first outlet. Increase beyond #10 AWG if required for compliance with code-mandated voltage drop restrictions.
6. Conductors used in runs consisting of more than six wires (exclusive of grounding conductors) in a single raceway shall be #10 AWG copper minimum. Increase beyond #10 AWG as required to comply with code-mandated derating factors, and as specified hereinbefore.
7. Circuits rated 150 volts or less to ground and 60 amperes or less, single-or 3-phase serving appliances as noted below shall be connected to panel branches that are equipped with ground fault interrupting features.

a. Drinking water coolers.
b. Bottle fill stations.
c. Vending machines.
d. Sump pumps.
e. Dishwashers.
f. Microwave ovens

8. Circuits supplying receptacles that are not of the ground fault circuit interrupting type, and are located as noted below, shall be connected to panel branches that are equipped with ground fault interrupting features. Where arc-fault protection is also required provide a circuit breaker which provides both arc-fault protection and ground fault interrupting protection.

a. Receptacles located in bathrooms. Bathrooms shall be defined as spaces containing a basin plus a toilet, tub or shower.
b. Receptacles located in locker rooms with associated shower facilities.
c. Receptacles located within 6 feet of any sink including those mounted within the cabinets below the sink and including those serving fixed equipment or appliances
d. Receptacles in wet locations.

D. The total load on a circuit shall be computed by ascribing volt-amps to individual items on the basis of the following:

ITEM	VOLT-AMPS (VA)
Any lighting fixture.	Input volt-amps as per lighting fixture schedule.
Any outlet with no specific wattage or circuiting instruction indicated.	180 volt amperes
Any outlet (other than for resistance heating) with wattage indicated.	1.15 x Indicated wattage
Any resistance heating outlet with wattage indicated.	1.0 x Indicated wattage
Any fractional HP motor with HP indicated.	2500 x Indicated HP
Any outlet with amps indicated.	120 x Indicated amps

1. Not more than 1300 total VA shall be applied to any 15 amp, 120 volt panel branch circuit nor more than 1450 VA to any 20 amp, 120 volt branch circuit.
2. A separate 20 amp panel branch circuit supplying no other outlets shall be used for each outlet indicated as an outlet.
3. Lighting fixture shall be connected to 20 amp panel branch circuits. Solidly connected equipment less than 1300 VA shall be connected to 15 amp panel branch circuits except as indicated or noted herein.
4. Lighting fixtures and receptacles shall not be connected to the same branch circuit.
5. Any installed lighting and appliance branch circuitry, found (as a result of unnecessarily light loading of conductors) to make excessive use of panel branches, shall be rearranged.
6. Circuits shall be balanced on phases at their supply point as evenly as possible.
7. The final arrangement of lighting and appliance branch circuitry shall be fully delineated on the record, or "as-built" drawings called for elsewhere.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Power and Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards

1.3 DEFINITIONS

A. Overcurrent Protective Device (OCD) (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
3. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70, as amended by state and local codes.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.

b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Government and Contracting Office no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Government and Contracting Officer's written permission.
3. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1
b. Outdoor Locations: NEMA 250, Type 3R
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finishes:

a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.

4. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

B. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

C. Main Devices: Mounted at top or bottom of panelboard to match incoming feeder. Branch mounted main devices are not acceptable.

2.2 PANELBOARD BUSES

A. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: To match bus material.
2. Feed-Through Lugs: type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
3. Subfeed (Double) Lugs: type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

B. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

C. Where wires or cables are used within panelboards to make up internal connections (factory installed or otherwise) such wire or cable shall have copper conductors only.

D. Where indicated or as required to assure ready accessibility of top switching and overcurrent device, they shall be arranged as multiple adjacent sections. A single overall cabinet shall be supplied for the multiple adjacent sections that constitute one panel. 1/4 inch minimum thickness plastic barriers having adequate angle iron framing support all around shall be included between sections. The entire assembly shall be such as to include wiring gutter space for each section as if it were an individual panelboard. Common bussing shall be arranged for adjacent sections unless there is indication that the individual sections are to be separately supplied. Sub-feed lugs with full capacity cable taps to adjacent panel sections will be accepted as the bussing method.

E. Panelboard Short-Circuit Current Rating: Fully rated to interrupt 65,000 amps symmetrical short-circuit current available at terminals.

2.3 POWER OR DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Main Overcurrent Protective Devices and Branch Overcurrent Protective Devices: as specified in Division 26, Section “Selection of Overcurrent Devices.”

D. Cabinet: width and depth adequate for a three pole branch device equal in rating to the panel mains. In no case shall the cabinet be wider than 42 inches or deeper than 18 inches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

E. Gutter space: adequate space for connecting to all active and spare branches.

F. Cabinet width: not to exceed 24 inches.

G. Cabinet depth: not to exceed 6 inches.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. As described in Division 26 Section “Selection of Overcurrent Devices”.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.7 PANELBOARD SHORT CIRCUIT RATINGS

A. Panelboards shall bear U.L. labels attesting to the adequacy of the equipment to withstand and interrupt short-circuit currents not less than those available at their incoming terminals. Panels shall be fully rated.

B. Panelboard short circuit ratings shall comply with the following:

1. 120/208 volt power or distribution panels shall be fully rated for not less than 22,000 amps.
2. 120/208 volt lighting or appliance panels shall be "fully rated" for 10,000 amps except that panels supplied from transformers 225 KVA and larger shall be "fully rated" or "series connected" rated for not less than 22,000 amps.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

B. Equipment Mounting: Install floor-mounted panelboards on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 “Cast-in-Place Concrete” and Section 033053 “Miscellaneous Cast-in-Place Concrete.”

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structure concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Mount top of trim 74 inches above finished floor unless otherwise indicated. In dwelling units that are accessible, mount such that highest device operator is no more than 48 inches above finished floor. Note that lowest device operator shall be no less than 15 inches above finished floor.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Stub four 1-inch (27-mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-mm) empty conduits [**into raised floor space or**] below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

J. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Government's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.6 CLEANING

A. In completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 262713

ELECTRICITY METERING (UTILITY)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Section: The following sections contain requirements that relate to this section:

1. Section 260500 “Common Work Results for Electrical”.

1.2 SUMMARY

A. Section includes equipment for electricity metering by utility company.

1.3 DEFINITIONS

A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For electricity-metering equipment.

1. Dimensioned plans and sections or elevation layouts.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 RELATED STANDARDS

A. The modular tenant metering and all accessories shall be designed, manufactured and tested in accordance with the latest applicable standards of the following:

1. ANSI.
2. NEMA PB2, PB1.
3. UL50, UL67, UL414, UL 489, UL 2735.
4. NFPA 70, NEC as amended by state and local codes.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the electrical code by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB-1.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Government and Contracting Officer no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Government and Contracting Officer's written permission.

1.9 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:

1. Comply with requirements of utilities providing electrical power services.
2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY AT MAIN SERVICE EQUIPMENT

A. All electricity delivered to the project will be utility company metered through a main "house" metering installation.

B. [All electricity delivered to the project will be utility company metered through various metering installations as follows:

1. Electricity consumed in the interest of the Government will be measured through a separate "house" metering installation.

C. Provide meter pans and/or backboards and current transformers, cabinets and for "house" metering [and major tenant metering] at wall field adjacent to utility transformer.

D. Provide instrument wiring between all current transformer cabinets and meter pans and/or backboards.

E. Provide "house" meter totalizing impulse wiring systems.

F. Install current transformers furnished by the utility company.

G. Meters will be furnished and installed by the utility company.

H. All work for the metering installation shall be provided in accordance with instructions issued by the utility company.

I. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

J. Meter Sockets: Comply with requirements of electrical-power utility company.

K. Meter Sockets: Steady-state and short-circuit current ratings shall exceed the available fault current at the equipment.

PART 3 - EXECUTION

3.1 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. The switchboard shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment. The main circuits shall be given a dielectric test of 2200 volts for one (1) minute between live parts and ground and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one (1) minute between live parts and ground.

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.2 INSPECTION

A. Examine area to receive switchboard to provide adequate clearance for switchboard installation.

B. Check that concrete pads are level and free of irregularities.

C. Start work only after unsatisfactory conditions are corrected.

3.3 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure, using a Megger, the insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 volts dc; minimum acceptable value for insulation resistance is 1 megohm.

NOTE: Refer to manufacturer's literature for specific testing procedures.

C. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

3.4 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement per manufacturers specifications.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. Adjust circuit breaker trip and time delay settings to values indicated, as instructed by the Contracting Officer.

3.5 CLEANING

A. Touchup scratched or marred surfaces to match original finish using touch up paint provided by the manufacturer.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, USB ports, and associated device plates.
2. Tamper-resistant receptacles.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Leviton Mfg. Company, Inc.
3. Legrand; Pass & Seymour.
4. Eaton Corporation; Arrow Hart.

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70 as amended by state and local codes.

C. Devices shall utilize screw terminals for wiring termination. Push in type connectors are not acceptable.

D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

E. Provide Rectangular (decorator) style in public.

F. All wiring devices shall be Hospital Grade where installed in hospitals and other health care facilities, as well as in medical offices and patient care areas in any occupancy group.

G. Tamper resistant in:

1. Dwelling units and in public spaces including corridors, hallways, lobbies, and other areas used in common by occupants.
2. Guest rooms and suites and in public spaces including corridors, hallways, lobbies, and other areas used in common by occupants.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Description: As specified above for convenience receptacles with GFCI features and with feed-thru capability.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Description: As specified above for tamper-resistant receptacles and for GFCI receptacles.

2.5 SPD RECEPTACLES

A. Duplex SPD Convenience Receptacles:

1. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

B. Isolated-Ground, Duplex Convenience Receptacles:

1. Description:

a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

C. Hospital-Grade, Duplex Convenience Receptacles: Comply with UL 498 Supplement sd.

1. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: as selected by Contracting Officer.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant[**, die-cast aluminum**] [**thermoplastic**] with lockable cover. Enclosures for 120 Volt receptacles rated 20 Amperes or less shall be weatherproof whether or not the attachment plug cap is inserted.

2.7 FINISHES

A. Device Color:

1. Wiring Devices: As selected by Contracting Officer unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Do not install receptacles in face-up position unless the receptacle is part of listed furniture assembly, or installed in a listed floor box.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. GFCI devices may be utilized where readily accessible. Where access to device may be blocked by a piece of equipment or door a GFCI type circuit breaker as specified in Section “Selection of Overcurrent Devices” shall be utilized.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes. Use red-filled lettering for devices supplied by generator.

C. All non-locking type 125 Volt, 15- and 20-ampere receptacles that are controlled by an automatic control device, or that incorporate feature that removes power from the receptacle for the purpose of energy management or building automation, shall be permanently marked with a symbol and the word “controlled”. The marking shall be located on the receptacle face.

3.3 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case switches.
5. Molded-case circuit breakers (MCCBs).
6. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70 as amended by state and local codes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Government and Contracting Officer no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Government and Contracting Officer’s written permission.

4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Refer to Division 26 Section “Selection of Overcurrent Devices” for additional information.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
5. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 or as required for the Division and Group
6. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosures before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as required by overcurrent protective device coordination study.

END OF SECTION

Environmental Health & Engineering, Inc.
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August 21, 2024

Jonathan Traficonte, AIA
Principal
Schwartz/Silver Architects Inc.
75 Kneeland Street
Boston, MA 02111

RE: **Pre-Renovation Hazardous Materials Inspection—Renovation of Chauffeur's Quarters and Garage, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts (EH&E 26741)**

Dear Mr. Traficonte:

Environmental Health & Engineering, Inc., provides this report to Schwartz/Silver Architects, Inc. describing results of our pre-renovation survey for asbestos-containing materials, lead in paint, and miscellaneous hazardous materials in areas of Boston National Historical Park, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, on May 29, 2024.

If you have any questions, please feel free to contact us at 1-800-TALK-EHE (1-800-825-5343).

Sincerely,

Adam S. Bisol
Senior Scientist
Massachusetts Certified Asbestos Inspector AI 061329
Massachusetts Certified Asbestos Consulting Firm AF 000107

Cynthia D. Campisano, M.S., P.G.
Senior Scientist/Project Manager

ENVIRONMENTAL HEALTH
& ENGINEERING, INC.

Pre-renovation Hazardous Materials Survey
Building 1, 21 Second Avenue
Charlestown Navy Yard
Boston, Massachusetts

Prepared For:
Jonathan Traficonte, AIA
Principal
SchwartzSilver Architects Inc.
75 Kneeland Street, Boston, MA 02111

Prepared By:
Environmental Health & Engineering, Inc.
180 Wells Avenue, Suite 200, Newton, MA 02459-3328
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August 21, 2024

EH&E Project 26741

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LIST OF ABBREVIATIONS AND ACRONYMS

ACM	asbestos-containing material
ACWM	asbestos-containing waste material
AHERA	Asbestos Hazard Emergency Response Act
AIL	Asbestos Identification Laboratory
Building	Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts
CFR	Code of Federal Regulations
EH&E	Environmental Health & Engineering, Inc.
EPA	U.S. Environmental Protection Agency
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute of Standards and Technology
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	U.S. Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
Site	Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts
TSI	thermal systems insulation

1.0 EXECUTIVE SUMMARY

Environmental Health & Engineering, Inc. (EH&E) provides this report to SchwartzSilver Architects Inc. (SchwartzSilver) describing the findings from our pre-renovation survey for asbestos-containing materials (ACMs) and miscellaneous hazardous materials in Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, in May of 2024. EH&E's assessment was performed to support the planned renovations to of the Building. The purpose of this assessment was to identify the nature and extent, as well as to quantify ACMs and hazardous building materials that may be present in the Building and potentially disturbed by the renovations. EH&E relied upon information provided by SchwartzSilver to determine the extent of renovation at the Building.

EH&E's major findings from the assessment in May of 2024 are summarized in Table 1.1. Explanations of all methods, findings, analyses, and conclusion are included in the body of the report. Please note that this report is subject to the limitations in Appendix A.

Table 1.1 Summary of Findings, Hazardous Materials Assessment, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, May 29, 2024

Hazardous Material	Description	Report Section
Regulated Asbestos-containing Material (ACM)*	• Six ACMs were identified at the Building: – Two types of thermal systems insulation, cement board, and three types of sealant are ACM – Roofing materials were inaccessible for sampling at this time and are considered to contain presumed asbestos-containing materials (PACM)	3.0
Lead in Paint	• Two paint schemes, the green garage doors and trim, as well as interior white painted walls, windows, and door frames in the quarters sections, are coated with paint that contained detectable lead greater than 2% by weight	4.0
Miscellaneous Hazardous Inspections	• Three building materials that may contain PCBs and are likely to be impacted by the project were identified. Two of the three did not contain detectable PCBs and one contained less than 1 part per million total PCBs. • No mercury ampules were observed at the site • Visual inspection identified mold-impacted and water-damaged building materials	5.0

* Regulated asbestos-containing materials are building materials analyzed to contain equal to or greater than (≥) 1.0% asbestos by polarized light microscopy (PLM) or PLM Point Counting. Materials containing trace amounts of asbestos (< 1.0 % asbestos) are classified as asbestos-containing waste material; another regulated material.

2.0 BACKGROUND AND PURPOSE

The Building was renovated in late 1930s or later to add the Gate House to the Garage and Chauffeur's Quarters. The original date of construction was not provided to EH&E. The original construction is masonry and steel frame with brick and mortar exterior and a combination of flat roofs. Interior finishes consist of carpeted wood floor, ceramic floor tile, and concrete flooring systems. Wall materials are generally plaster over/or exposed brick masonry with some gypsum board partition walls. Most ceilings are plaster with cement board in the garages under metal joist and wood framed deck, and limited areas of original lighting systems.

The purpose of this assessment is to identify the nature and extent, as well as to quantify hazardous materials that may be present in the Building and potentially disturbed by the renovation project.

3.0 ASBESTOS BUILDING MATERIALS SURVEY

EH&E performed a semi-destructive asbestos survey at the Building to identify, locate, and sample accessible suspect ACMs on May 29, 2024. This survey was performed in support of planned demolition and renovation at the Building in accordance with the requirements of the U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAPs) regulation, Title 40 Code of Federal Regulations (CFR) Part 61.145. NESHAPs requires, prior to building demolition or renovation, the removal and disposal of friable asbestos-containing building materials or those materials that will become friable as a result of demolition or renovation work.

ACMs are defined by the Commonwealth of Massachusetts as materials that contain 1.0% or more asbestos (MADEP 310 CMR 7.15; MADLS 454 CMR 28). Massachusetts regulations also require that materials containing trace amounts of asbestos (<1.0 % asbestos), which are classified as asbestos-containing waste materials (ACWMs), be packaged, transported, and disposed of in the same manner as ACMs (MADEP 310 CMR 7.15).

3.1 SAMPLING AND ANALYTICAL METHODOLOGY

Adam S. Bisol of EH&E, a U.S. Environmental Protection Agency (EPA) Accredited and Commonwealth of Massachusetts Certified Asbestos Inspector (AI061329), conducted the targeted asbestos inspection in the Building. Appendix B includes background information and a summary of sampling methods used to conduct the focused asbestos inspection.

During the inspection, EH&E identified and sampled thirty-three (33) homogenous suspect ACM in the Building likely to be affected by the renovations and/or demolitions and identified six (6) systems (pipe insulation, elbow insulation, cement board ceilings, exterior window glazing compound, and skylights window glazing compound) that contained asbestos. EH&E collected seventy-six (76) discrete bulk samples of the suspect materials for laboratory analysis. Asbestos was detected in eleven (11) samples of the sampled suspect materials. The bulk samples were submitted to Asbestos Identification Laboratory, Inc. of Woburn, Massachusetts, for asbestos analysis using polarized light microscopy by EPA Method 600/R-93/116. Suspect materials identified and sampled for the presence of asbestos are described in Table 3.1. The analytical laboratory report is included in Appendix D.

EH&E's survey methods are designed so that suspect ACMs are identified and sampled in accordance with the EPA 40 CFR 763, Subpart E, *Asbestos Containing Materials in Schools,* and U.S. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101, *Occupational Exposure to Asbestos* (Construction Industry Standard). EH&E's survey involved a walkthrough of renovation areas at the Building to identify, quantify, and sample homogeneous applications

of suspect building materials. EH&E utilized semi-destructive sampling methods to provide access to concealed building materials. EH&E's survey was limited to accessible (via semi-destructive sampling) building materials within the renovation area.

Sampling of suspect materials was conducted in accordance with the protocols set forth in 40 CFR 763.85. The Asbestos Hazard Emergency Response Act (AHERA) standard classifies all suspect materials into three categories: surfacing materials, thermal system insulation, and miscellaneous materials. The AHERA standard also specifies and provides guidance on the number of samples to be collected from each homogeneous material depending on the category in which the material has been classified:

- Surfacing materials require random sampling. The total number of samples collected is based on the square footage of the material. A minimum of three samples is taken for quantities between 0 and 1,000 square feet, five samples are taken for quantities between 1,000 and 5,000 square feet, and seven samples are taken for quantities greater than 5,000 square feet.

- Thermal system insulation requires a minimum of three samples per each homogeneous material or one per patched area less than 6 linear feet.

- Miscellaneous materials require the inspector to take enough samples of each homogeneous material to be representative. Typically, EH&E will collect a minimum of two samples of miscellaneous materials.

After collection, all samples were hand delivered by EH&E to Asbestos Identification Laboratory (AIL) located in Woburn, Massachusetts, under chain of custody. All suspect asbestos samples were submitted to AIL for asbestos analysis using EPA Method 600/R-93/116—Polarized Light Microscopy. All samples are carefully handled and stored to assure their integrity. Bulk samples are routinely retained for a period of 90 days after results are reported to allow for any required analytical follow-up and/or reanalysis. If you wish to retain the bulk samples, please notify EH&E within ten days of receipt of this report.

AIL is fully accredited to perform asbestos bulk sample analysis under the National Voluntary Laboratory Accreditation Program (NVLAP) (Laboratory Code: 200919-0) administered by the National Institute of Standards and Technology (NIST). The laboratory is also licensed by the Commonwealth of Massachusetts Department of Labor Standards (License #AA000208). AIL's quality assurance and control program was developed in strict compliance with NIST/NVLAP requirements and involves the following key components: use of established or standard sampling and analytical methodologies, continuous monitoring of the operational performance of the laboratory, and periodic evaluation of the performance and analytical variability of each laboratory analyst.

3.2 FINDINGS

Asbestos was detected in samples of six homogenous material during the survey. Table 3.1 provides information on the ACM identified in the renovation area by EH&E. Table C.1 in Appendix C provides a listing of all suspect homogenous building materials sampled and analyzed for asbestos content. Laboratory reports are included in Appendix D. Appendix E provides a plan detailing known ACM extent and suspect asbestos sample locations. The identified ACM included pipe insulation, elbow insulation, cement board ceilings, frame caulk around garage door trim, exterior window glazing compound, and skylights window glazing compound

Table 3.1 Regulated[1] Asbestos-containing Materials, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, May 29, 2024

Suspect Material Code	Material Description	Material Location(s)	Percent Asbestos and Type	Approximate Quantity
TSI 1	White, magnesia pipe run insulation	Rear elevation (stone block wall) of quarters, running from outside the building to the garage, concealed behind wall in bathroom	17-27% CHR	50 LF
TSI 2	White, hand-packed, cloth wrapped elbow insulation		25-28% CHR	10 EA
CB 1	Grey cement board	Garage ceiling	16-18% CHR	300 SF
FC 3	Residual frame caulk, brick to wood trim	Garage bay doors	3% CHR	100 LF
WGC 3	Exterior, white glazing compound on wood	Quarters, wood framed windows	5% CHR	50 SF
WGC 4	Grey glazing compound	Garage skylights, intraframe	5% CHR	100 SF

CHR chrysotile
LF linear feet
EA each
SF square feet

[1] Regulated asbestos-containing materials are building materials determined to contain ≥1.0% asbestos by polarized light microscopy (PLM). Trace amounts of asbestos in regulated concentrations (<1.0% asbestos) is considered an asbestos-containing waste material and is included as a regulated material.

Blue shading denotes one or more samples of the material were determined to be ACM, containing asbestos in regulated concentrations (≥1.0% asbestos).

Samples analyzed using polarized light microscopy (PLM) by Asbestos Identification Laboratory (AIL), Woburn, Massachusetts. AIL is accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program for asbestos analysis of bulk samples by PLM with dispersion staining: 200929-0. Samples analyzed for chrysotile, amosite, crocidolite, actinolite, tremolite, and anthophyllite type asbestos fibers.

The ACM listed in Table 3.1 will be disturbed by planned renovation activities and should be properly abated and disposed of by a licensed asbestos abatement contractor prior to demolition in accordance with all applicable regulations. An asbestos project monitor is also required to conduct visual inspections and for some materials air sampling after completion of abatement and prior to re-occupancy by individuals without appropriate training for asbestos work, including building occupants, staff, or construction workers.

3.2.1 Mechanical Systems

Suspect thermal systems insulation (TSI) materials were identified as ACM during this survey. The exposed TSI consisted of white magnesia pipe runs with cloth wrapped, hand packed elbows on a pipe running into the building from the rear of the quarters side through the back of the bathroom wall and into the garage. If planned renovations will disturb this material, this ACM should be removed and properly disposed of by a Massachusetts licensed abatement contractor. No other insulated pipes were observed during this inspection.

No duct mastic associated with ducts in mechanical systems was observed.

3.2.2 Ceiling Systems

An ACM cement board ceiling, 4’ x 8’ panels, was identified in the garage space. If planned renovations will disturb this material, this ACM should be removed and properly disposed of by a Massachusetts licensed abatement contractor. Various types of cellulose ceiling tiles and plaster ceilings were observed in the office and common areas throughout the space. The samples of these materials did not contain detectable concentrations of asbestos. Plaster ceilings or ceiling tiles were hung below wood frame roof joists. Spray-applied fireproofing was not observed on structural members above the suspended ceiling.

3.2.3 Wall Systems

The wall systems in areas inspected at the Site consist of partition walls, built from plaster sometimes covered with gypsum board drywall and joint compound and brick demising walls. Ceramic tiles cover the bathroom walls. Wall system materials were not identified as ACM.

3.2.4 Floor Systems

The floors in the quarters section are a concealed wood layer below carpet and /or ceramic tile. No slip paper was observed in the wood floor.

3.3 LIMITATIONS OF SURVEY

The surveys were performed in support of demolition of interior building materials for the SchwartzSilver renovation project at the Building. EH&E relied upon SchwartzSilver provided drawings to determine the extent of renovation at the Building. EH&E makes no representation with regard to subsurface and/or latent conditions and/or buried piping networks that may exist inside or outside the building and run through the property. EH&E did not collect soil samples and makes no representation as to whether or not buried suspect ACMs exist at the property.

All conditions as stated herein are based upon field observations made at the time of the inspection. EH&E recommends that if any additional suspect material is discovered during demolition activities, that the activities be suspended until samples of the suspect materials are collected by an accredited and certified asbestos inspector and analyzed for asbestos content.

4.0 LEAD-BASED PAINT SURVEY

EH&E conducted a lead-based paint survey of painted and/or coated surfaces at the Site. The inspection was conducted to support demolition and waste managment efforts, and is not designed to support child occupancy of the buildings. Prior to disposal, the demolition debris waste stream may require characterization via toxicity characteristic leaching procedure analysis, as prescribed by the Resources Conservation and Recovery Act. Some lead-containing wastes can be recycled. The following sections describe the testing program and paint chip analysis results.

4.1 BACKGROUND

A number of regulations govern the management of lead-containing materials in buildings. Commercial facilities are subject to the OSHA regulations for the construction industry (29 CFR 1926), including hazard communication and work practices for maintenance and renovation activities. The OSHA Lead Construction Standard 29 CFR 1926.62 deals with worker exposure at any concentration of lead in paint. Employers must provide a complete worker protection and exposure program for any renovation or demolition activities where lead is discovered in paint at any concentration. A hazard assessment must be completed by the employer to determine site-specific requirements for compliance. Programs must address respiratory protection and include personal air sampling for the various tasks being performed. In addition, the OSHA regulations state that the testing and disposal of hazardous materials as well as a respiratory protection program, personal air sampling, and medical monitoring is the responsibility of the contractor selected to perform the renovation and/or demolition. EPA and Massachusetts regulations further define requirements for the disposal of lead-containing wastes.

Maintenance, renovation or demolition activities that may disturb lead must be conducted in accordance with the OSHA regulations 29 CFR 1910, *Occupational Safety and Health Standards* and 29 CFR 1926, *Safety and Health Regulations for Construction*. The regulation requires initial exposure assessment for each task where employees may be exposed to lead. The standard sets requirements for interim protective measures that must be followed for certain activities until the initial exposure assessment is completed. These protective measures include:

- Appropriate respiratory protection
- Appropriate protective clothing
- Change areas and hygiene facilities
- Biological monitoring

Debris generated from the lead-based paint surfaces during renovation or demolition must be properly disposed of and is typically analyzed using Toxicity Characteristic Leaching Procedure as required by the EPA to determine if the material must be disposed of as hazardous waste.

Lead paint on metal surfaces can typically be disposed of by recycling. In general, the costs of segregating these wastes for recycling can be offset by funds generated by the metals sent for recycling. However, de-leading is often required for metal surfaces, such as columns, beams, joists, and decks at locations where welding or other hot work may be performed.

4.2 SAMPLING METHODOLOGY

EH&E collected paint chip samples of the observed paint schemes in the renovation project areas. Samples were transported to Aerobiology Laboratory Associates, Inc. of Woburn, Massachusetts, and analyzed via Atomic Absorption Spectrometry, EPA Method SW846-7000B/3051 At each location tested, detection limits were dependent upon the mass of samples collected. The analytical detection limit was 0.014 by weight for the sample with no detectable lead. Sample locations are illustrated in Figure E.1 in Appendix E.

4.3 FINDINGS

On May 29, 2024, EH&E collected samples of accessible representative painted surfaces in the Space. Results of laboratory analysis are quantified as percent by weight of sample. Three (3) samples were collected representing applications on similarly painted interior walls, ceilings, doors and windows, and exterior painted wood surfaces. The summary of analytical results for paint samples collected can be found in Table 4.1 and the laboratory report is included in Appendix D.

Table 4.1 Results of Lead Analysis, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, May 29, 2024

Sample ID Number	Paint Color Scheme	Testing Location	Percentage by weight
Paint 1	Green exterior paint	Gate house exterior, composite	BRL <0.014
Paint 2	**Green exterior paint**	**Garage bay openings trim and doors, composite**	**4.16**
Paint 3	**White interior paint**	**Interior walls and wood trim elements, composite**	**2.49**

BRL below reporting limit
< less than

Bolded text indicates lead detected in the sample

Samples analyzed using EPA Method SW 846-7000B/3051 Atomic Absorption Spectrometry by Aerobiology Laboratory Associates, Inc., Woburn, Massachusetts. Aerobiology Laboratory is accredited by the American Industrial Hygiene Association (AIHA), Laboratory Accreditation Program (LAP) for chemical analysis of bulk samples, ID# 102754.

Samples of two types of paint schemes contained detectable concentrations of lead, including green exterior paint associated with the garage bay doors and trim, and white interior paint on the walls and wood trim elements in the Chauffeur's Quarters area. EH&E recommends informing the contractor that these paints may contain lead so they can comply with the OSHA lead in construction standard and EPA regulations during any disposal. If these paints are disturbed during the renovation project, the contractor should also use appropriate dust control methods.

5.0 MISCELLANEOUS HAZARDOUS MATERIALS SURVEY

5.1 MOLD-IMPACTED BUILDING MATERIALS

On May 29, 2024, EH&E inspected accessible building materials at the Site and representative above ceiling locations to identify visible signs of mold growth. This assessment included a visual survey of accessible surfaces to identify staining, efflorescence, or other visible signs of water damage. EH&E observed areas of visible mold growth associated with water-damaged walls, ceilings, and flooring systems inspected at the Site.

5.2 POLYCHLORINATED BIPHENYL-CONTAINING BUILDING MATERIALS

Polychlorinated biphenyls (PCBs) belong to a broad family of manmade organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban.

According to the U.S. Environmental Protection Agency (EPA), materials that may contain PCBs include:

- Dielectric oil in transformers and capacitors
- Dielectric oil in other electrical equipment including voltage regulators, switches, reclosers, bushings, and electromagnets
- Oil used in motors and hydraulic systems
- Old electrical devices or appliances containing PCB capacitors
- Fluorescent light ballasts
- Caulk
- Industrial paints/mastics

On May 29, 2024, EH&E performed an investigation to identify accessible materials that may contain PCBs such as caulking, sealants, and paints used throughout the Building. EH&E walked the building to identify elements where PCB-suspect materials were likely to be found. EH&E found three types of window and door systems with sealants within and around them.

On May 29, 2024, EH&E collected three (3) representative samples of the caulk on the Building from multiple locations throughout the Building. One type of caulk sampled contained detectable PCB concentrations, but did not exceed EPA regulatory levels.

Table 5.1 provides the analytical results for samples of building materials suspected to contain PCBs identified at the Building along with the material location and description. Samples were analyzed by Alpha Analytical Inc., Eight Walkup Drive, Westborough, Massachusetts, via EPA Method 8082 (GC/ECD) with Soxhlet Extraction. The laboratory report is provided in Appendix D. Sample locations are illustrated in Figure E.1 in Appendix E.

Table 5.1 Bulk Sample Results for Polychlorinated Biphenyls in Building Materials in Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, May 29, 2024

Sample ID	Sample Description	Sample Location	Aroclor[1, 2]		
			1254 ppm_w	1260 ppm_w	1268 ppm_w
FC 1	Grey door frame caulk	Gate house door and window frames	ND	0.670	ND
FC 2	Beige window frame caulk	Chauffeur's quarters window frames to brick	ND	ND	ND
FC 3	Residual grey caulk	Garage doors wood brick molds to brick	ND	ND	ND

ppm_w parts per million by weight
ND not detected above the laboratory's reporting limit

Blue shading denotes the materials were determined to be "excluded PCB products"

1 Analysis performed by Alpha Analytical, Inc. Eight Walkup Drive, Westborough, Massachusetts. Samples were extracted using U.S. Environmental Protection Agency (EPA) Method 3540C (soxhlet extraction) and analyzed via EPA Method 8082.
2 Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268 were all tested.

6.0 REFERENCES

EPA 40 CFR 61.145. National Emissions Standards for Hazardous Air Pollutants. *Code of Federal Regulations*, Title 40, Part 61, Section 145, Standard for Demolition and Renovation. Washington, DC: U.S. Environmental Protection Agency.

EPA 40 CFR 763. Asbestos. *Code of Federal Regulations*. Title 40, Part 763, Subpart E, Asbestos-Containing Materials in Schools. Washington, DC: U.S. Environmental Protection Agency.

EPA 40 CFR 763.85. Asbestos. *Code of Federal Regulation*s, Title 40, Part 763, Section 85, Inspections and Reinspections. Washington, DC: U.S. Environmental Protection Agency.

MADEP 310 CMR 7.15. Air Pollution Control. *Code of Massachusetts Regulations.* Title 310, Part 7, Section 15, Asbestos. Boston, MA: Commonwealth of Massachusetts, Department of Environmental Protection.

MADLS 454 CMR 28. The Removal, Containment, Maintenance or Encapsulation of Asbestos. *Code of Massachusetts Regulations,* Title 454, Part 28. Boston, MA: Commonwealth of Massachusetts, Department of Labor Standards.

OSHA 29 CFR 1910. Occupational Safety and Health Standards. *Code of Federal Regulations.* Title 29, Part 1910. Washington, DC: U. S. Occupational Safety and Health Administration.

OSHA 29 CFR 1926. Safety and Health Regulations for Construction. *Code of Federal Regulations*, Part 29, Title 1926. Washington, DC: U.S. Occupational Safety and Health Administration.

OSHA 29 CFR 1926.62. Safety and Health Regulations for Construction. *Code of Federal Regulations*, Part 29, Title 1926, Section 62, Lead. Washington, DC: U.S. Occupational Safety and Health Administration

OSHA 29 CFR 1926.1101. Safety and Health Regulations for Construction. *Code of Federal Regulations*, Part 29, Title 1926, Section 1101, Asbestos. Washington, DC: U.S. Occupational Safety and Health Administration.

APPENDIX A

LIMITATIONS

LIMITATIONS

1. Environmental Health & Engineering, Inc.'s (EH&E) assessment described in the attached report number 26741, *Pre-renovation Hazardous Materials Survey, Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts* (hereafter "the Report"), was performed in accordance with generally accepted practices employed by other consultants undertaking similar studies at the same time and in the same geographical area; and EH&E observed that degree of care and skill generally exercised by such other consultants under similar circumstances and conditions. The observations described in the Report were made under the conditions stated therein. The recommendations presented in the Report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services.

2. Observations were made of the site as indicated within the Report. Where access to portions of the site was unavailable or limited, EH&E renders no opinion as to the condition of that portion of the site.

3. The observations and recommendations contained in the Report are based on limited environmental sampling and visual observation and were arrived at in accordance with generally accepted standards of site assessment practice. The sampling and observations conducted at the site were limited in scope and, therefore, cannot be considered representative of areas not sampled or observed.

4. When an outside laboratory conducted sample analyses, EH&E relied upon the data provided and did not conduct an independent evaluation of the reliability of these data.

5. The purpose of the Report was to assess the characteristics of the subject site as stated within the proposal. No specific attempt was made to verify compliance by any party with all federal, state, or local laws and regulations.

APPENDIX B

ASBESTOS INSPECTION BACKGROUND AND METHODS

ASBESTOS INSPECTION BACKGROUND AND METHODS

BACKGROUND

The U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAPs) regulation, Title 40 Code of Federal Regulations (CFR) Section 61.145 requires, prior to building demolition or renovation, the removal and disposal of friable asbestos-containing building materials or those materials that will become friable as a result of demolition or renovation work.

The Commonwealth of Massachusetts classifies materials as asbestos-containing materials (ACMs) when they contain greater than or equal to 1.0% asbestos. Trace concentrations (less than 1.0%) of asbestos require transport as ACM waste to an out of state facility. Environmental Health & Engineering, Inc. (EH&E) recommends that anyone handling building materials with trace concentrations of asbestos be properly notified of the material's asbestos status.

The NESHAPs regulations require that the following types of materials be removed from a facility to be extensively renovated or demolished before any activity begins that would break up, dislodge, or disturb the material: all regulated ACMs, Category I Non-friable ACM (that is friable or in poor condition), and Category II Non-friable ACM with high probability that the materials will become friable during demolition activities.

All identified ACM that is friable, likely to be rendered friable, or cannot be removed reasonably intact by the planned demolition process must be removed in accordance with federal and Commonwealth of Massachusetts regulations,[1,2] which require that the materials be removed by a licensed asbestos abatement contractor prior to demolition work. Commonwealth regulations also require that response actions be cleared by a trained and licensed project monitor who will perform visual inspections and air sampling at the end of a response action.

SAMPLING METHODS

EH&E's survey methods are designed so that suspect ACMs are identified and sampled in accordance with the EPA Asbestos Hazard Emergency Response Act (AHERA) regulations[3] and U.S. Occupational Safety and Health Administration, Occupational Exposure to Asbestos/

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[1] MADLWD 454 CMR 28. The Removal, Containment, Maintenance or Encapsulation of Asbestos. *Code of Massachusetts Regulations*. Title 454, Part 28. Boston, MA: Commonwealth of Massachusetts, Department of Labor Standards.

[2] MADEP 310 CMR 7.15. Air Pollution Control. *Code of Massachusetts Regulations*. Title 310, Part 7, Section 15, U Asbestos. Boston, MA: Commonwealth of Massachusetts, Department of Environmental Protection.

[3] EPA 40 CFR 763. Asbestos. *Code of Federal Regulations*. Title 40, Part 763, Subpart E, Asbestos-Containing Materials in Schools. Washington, DC: U.S. Environmental Protection Agency.

Construction Industry Standard.[4] EH&E's survey involved a walkthrough in the space to identify, locate, and sample homogeneous applications of suspect ACMs that were reported to impacted by upcoming demolition/renovation activities.

Sampling of suspect ACMs was conducted in accordance with the AHERA protocols set forth in 40 CFR 763.85. The AHERA standard classifies all suspect materials into three categories: surfacing materials, thermal system insulation, and miscellaneous materials.

The AHERA standard also specifies and provides guidance on the number of samples to be collected from each homogeneous material depending on the category in which the material has been classified:

- Surfacing materials require random sampling. The total number of samples collected from each homogenous material is based on the square footage of the material. A minimum of three samples is collected for quantities up to 1,000 square feet, five samples are collected for quantities between 1,000 and 5,000 square feet, and seven samples are collected for quantities greater than 5,000 square feet.

- Thermal system insulation requires a minimum of three samples per each homogeneous material or one per patched area less than six linear feet.

- Miscellaneous materials require the inspector to collect enough samples of each homogeneous material to be representative. Typically, EH&E will collect a minimum of two samples of miscellaneous materials.

[4] OSHA 29 CFR 1926.1101. Safety and Health Regulations for Construction. *Code of Federal Regulations*. Title 29, Part 1926, Section 1101, Asbestos. Washington, DC: U.S. Occupational Safety and Health Administration.

APPENDIX C

SUSPECT MATERIALS LIST

SUSPECT MATERIALS LIST

Table C.1 Suspect Asbestos-containing Materials Sampled from Building 1, 21 Second Avenue, Charlestown Navy Yard, Boston, Massachusetts, May 29, 2024

Homogenous Material Code Sample ID		Material Description	Sample Location(s)	Friable	Damage (Yes/No)	Percent Asbestos and Type
CM 1 RM 1	A, B	Green mastic under black carpet tile with underlying residual black mastic	Gatehouse office	No	No	ND
TG 1 MB 1	A, B	Grey grout on red 5" ceramic tile with grey mortar bed	Gatehouse office	No	No	ND
TG 2 TA 2	A, B	Grey grout on 12" beige ceramic wall tile with tan adhesive	Gatehouse office	No	No	ND
JC 1	A, B	White joint compound on drywall	Gatehouse office walls	Yes	Yes	ND
GB 1	A, B	Paper backed drywall systems		Yes	Yes	ND
JC 2	A, B	White joint compound on drywall	Chauffeur's quarters walls	Yes	Yes	ND
GB 2	A, B	Paper backed drywall systems		Yes	Yes	ND
WP 1 WP 2	A – C	White skim coat wall plaster over grey base coat on metal mesh	Gatehouse office walls	Yes	Yes	ND
WP 3 WP 4	A – C	White skim coat wall plaster over grey base coat on metal mesh	Chauffeur's quarters walls	Yes	Yes	ND
WGC 1	A, B	White exterior window glazing compound	Gatehouse office	Yes	Yes	ND
WGC 2	A, B	White interior window glazing compound	Gatehouse office	Yes	Yes	ND
WGC 3	A, B	White exterior window glazing compound	Chauffeur's quarters	Yes	Yes	2% CHR
WGC 4	A, B	Grey window glazing compound	Garage skylights	Yes	Yes	3% CHR
TG 3 TA 3	A, B	White grout on 5" white ceramic wall tile with tan adhesive	Chauffeur's quarters	No	No	ND
FC 1	A, B	Frame caulk on brick mold door frames	Gatehouse office	No	No	ND
FC 2	A, B	Frame caulk on window frames	Chauffeur's quarters	No	No	ND
FC 3	A, B	Residual caulk on trim to masonry	Garage door frames	No	Yes	3% CHR
CT 1	A, B	2' x 4' White, random fissure and pinhole, cellulose ceiling tile	Gatehouse office	Yes	No	ND
CT 2	A, B	12" x 12" Beige, cellulose ceiling tile	Gatehouse office	Yes	Yes	ND
CA 1	A, B	Tan construction adhesive on CT 2 & CP1	Gatehouse office	Yes	Yes	ND
CT 3	A, B	2' x 2'/4' White, gypsum board ceiling tile	Gatehouse office	Yes	Yes	ND
CB 1	A, B	4' x 8' Grey cement board ceiling	Garage ceiling	Yes	Yes	16-18% CHR
CP 1 CP 2	A – C	White skim coat ceiling plaster over grey base coat on metal mesh	Gatehouse office	Yes	Yes	ND
TC 1 CP 3 CP 4	A – C	White surface texture over white skim coat ceiling plaster over grey base coat on metal mesh	Chauffeur's quarters	Yes	Yes	ND
TSI 1	A – C	White magnesia block pipe insulation	Chauffeur's quarters	Yes	No	17-27% CHR
TSI 2	A, B	White, cloth wrapped, hand packed pipe elbow insulation	Chauffeur's quarters	Yes	No	25-29% CHR

ND non-detect

Samples analyzed using polarized light microscopy (PLM) by Asbestos Identification Laboratory (AIL), Woburn, Massachusetts. AIL is accredited by the National Institute of Standards and Technology's, National Voluntary Laboratory Accreditation Program for asbestos analysis of bulk samples by PLM with dispersion staining.

Samples analyzed for chrysotile, amosite, crocidolite, actinolite, tremolite, and anthophyllite type asbestos fibers.

APPENDIX D

LABORATORY ANALYTICAL RESULTS

Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email: mikemanning@asbestosidentificationlab.com

NVLAP® Testing Lab Code: 200919-0

Batch: 117753

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: BULK PLM ANALYSIS, EPA/600/R-93/116

Dear Adam Bisol,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.
Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Information provided by the customer can affect the validity of results. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. All customer information will be maintained in confidentiality. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Adam Bisol for your business.

Michael Manning
Owner/Director

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: BULK PLM ANALYSIS, EPA/600/R-93/116

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
CM1-A 1302206			multi	Non-Fibrous 100	None Detected
CM1-B 1302207			multi	Non-Fibrous 100	None Detected
RM1-A 1302208			black	Non-Fibrous 100	None Detected
RM1-B 1302209			black	Non-Fibrous 100	None Detected
TG1-A 1302210			gray	Non-Fibrous 100	None Detected
TG1-B 1302211			gray	Non-Fibrous 100	None Detected
MB1-A 1302212			white	Non-Fibrous 100	None Detected
MB1-B 1302213			white	Non-Fibrous 100	None Detected
TG2-A 1302214			gray	Non-Fibrous 100	None Detected
TG2-B 1302215			gray	Non-Fibrous 100	None Detected
TA2-A 1302216			multi	Non-Fibrous 100	None Detected
TA2-B 1302217			multi	Non-Fibrous 100	None Detected
TG3-A 1302218			white	Non-Fibrous 100	None Detected
TG3-B 1302219			white	Non-Fibrous 100	None Detected
TA2-A 1302220			white	Non-Fibrous 100	None Detected
TA2-B 1302221			white	Non-Fibrous 100	None Detected

Sampled: May 29, 2024 **Received:** June 04, 2024 **Analyzed:** June 05, 2024

Friday 07 June 2024

Analyzed by: Michael Manning

Batch: 117753

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: BULK PLM ANALYSIS, EPA/600/R-93/116

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
CA1-A 1302222			tan	Non-Fibrous 100	None Detected
CA1-B 1302223			tan	Non-Fibrous 100	None Detected
FC1-A 1302224			white	Non-Fibrous 100	None Detected
FC1-B 1302225			white	Non-Fibrous 100	None Detected
FC2-A 1302226			multi	Non-Fibrous 100	None Detected
FC2-B 1302227			multi	Non-Fibrous 100	None Detected
FC3-A 1302228			gray	Non-Fibrous 97	**Detected** **Chrysotile 3**
FC3-B 1302229			gray	Non-Fibrous 97	**Detected** **Chrysotile 3**
WGC 1-A 1302931			tan	Non-Fibrous 100	None Detected
WGC 1-B 1302932			tan	Non-Fibrous 100	None Detected
WGC 2-A 1302933			white	Non-Fibrous 100	None Detected
WGC 2-B 1302934			white	Non-Fibrous 100	None Detected
WGC 3-A 1302935			white	Non-Fibrous 98	**Detected** **Chrysotile 2**
WGC 3-B 1302936			gray	Non-Fibrous 100	None Detected
WGC 4-A 1302937			tan	Non-Fibrous 100	None Detected
WGC 4-A 1302938			tan	Non-Fibrous 97	**Detected** **Chrysotile 3**

Sampled: May 29, 2024 **Received:** June 04, 2024 **Analyzed:** June 05, 2024

Friday 07 June 2024

Analyzed by: Michael Manning

Batch: 117753

Client: EnE

Address:

Project Site & #: #26741

Phone / email address:

Contact:

Relinquish by/date:

Received by/date: VB 6/4/24

# of Samples Received: (32)

CHAIN OF CUSTODY

EPA/600/R-93/116

Asbestos Identification Lab
165 New Boston St.
Suite 227
Woburn, MA 01801
(781)932-9600
www.asbestosidentificationlab.com

Date Sampled: 5/29/24

BATCH# 117753 Rev 06/16

Turnaround Time

- [ ] Less 3 Hrs
- [ ] Same Day
- [ ] Next Day
- [x] 3 Day

Sample Method

- [x] Bulk
- [ ] Soil
- [ ] Wipe
- [ ] Point Count

Stop on 1st Positive? Yes/No

Notify Method: Mail/E-Mail/Verbal

Analyzed By: Valerie Jaouette?

Date: 6/6/24

Temp in Celsius = 22

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
1302206	CM 1-A 1	Material / Location	O	M	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
...07	CM 1-B 2	Material / Location	O	M	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
...08	RM 1-A 3	Material / Location	O	BK	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
09	RM	Material						Chrysotile															
	1-B 4	Location	0	BK	N	GN	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
10	TG	Material						Chrysotile															
	1-A 5	Location	0	GY	N	GN	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
11	TG	Material						Chrysotile															
	1-B 6	Location	0	GY	N	GN	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
12	MB	Material						Chrysotile															
	1-A 7	Location	0	2Y	N	GN	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
13	MB	Material						Chrysotile															
	1-B 8	Location	0	2Y	N	GN	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
15	TG 2-A 9	Material / Location	0	GY	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
16	TG 2-B 10	Material / Location	0	GY	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
14	TA 2-A 11	Material / Location	0	M	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
17	TA 2-B 12	Material / Location	0	M	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
12	TG 3-A 13	Material / Location	0	W	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
19	TG 3-B 14	Material / Location	0	W	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															100
								Anthophyllite															
								Actinolite															
20	TA 3-A 15	Material / Location	0	W	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															100
								Anthophyllite															
								Actinolite															
21	TA 3-B 16	Material / Location	0	W	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															100
								Anthophyllite															
								Actinolite															
22	CA 1-A 17	Material / Location	0	T	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															100
								Anthophyllite															
								Actinolite															
23	CA 1-B 18	Material / Location	0	T	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															100
								Anthophyllite															
								Actinolite															

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
24	FC 1-A 19	Material / Location	0	3	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
25	FC 1-B 20	Material / Location	0	3	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
26	FC 2-A 21	Material / Location	0	1	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
27	FC 2-B 22	Material / Location	0	1	N	GN	N	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
28	FC 3-A 23	Material / Location	0	GY	N	GN	N	Chrysotile	3	20	P	+	L	N	1.550	1.546							
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															97

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Material / Location	Temp in Celcius = ____	Stereo Scope					Asbestos Minerals	Optical Properties						RI		Non-Asbestos Percentage (%)						
				% of Asbestos	Color	Homogeneity	Texture	Friable		Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	=	⊥	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
29	FC 3-D 24	Material							Chrysotile	N	W	P	+	L	N	1.552	1.546							
		Location		O	G	N	CN	N	Amosite															
									Crocidolite															
									Tremolite															
									Anthophyllite															97
									Actinolite															
130231	WGC 1-A 25	Material							Chrysotile															
									Amosite															
									Crocidolite															
		Location		O	T	N	CN	N	Tremolite															
									Anthophyllite															
									Actinolite															100
32	WGC 1-B 26	Material							Chrysotile															
									Amosite															
									Crocidolite															
		Location		O	T	N	CN	N	Tremolite															
									Anthophyllite															
									Actinolite															100
33	WGC 2-A 27	Material							Chrysotile															
									Amosite															
									Crocidolite															
		Location		O	W	N	CN	N	Tremolite															
									Anthophyllite															
									Actinolite															100
34	WGC 2-B 28	Material							Chrysotile															
									Amosite															
									Crocidolite															
		Location		O	W	N	CN	N	Tremolite															
									Anthophyllite															
									Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
35	2GC 3-A 29	Material						Chrysotile	2	2	P	+	L	N	1.552	1.546							
		Location	O	2	N	G	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															98
36	2GC 3-B 30	Material						Chrysotile															
		Location	O	G	N	G	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
37	2GC 4-A 31	Material						Chrysotile															
		Location	O	T	N	G	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
1302995	2GC 4-B 32	Material						Chrysotile	3	2	P	+	L	N	1.552	1.546							
		Location	O	T	N	G	N	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															97
		Material						Chrysotile															
		Location						Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: 29 MAY 2024

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: ASBESTOS IDENTIFICATION LAB

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
CM1-A	BULK	EPA 600/R-93/116	
⊥ B	↓	↓	
RM1-A			
⊥ B			
TG1-A			
⊥ B			
MB1-A			
⊥ B			
TG2-A			
⊥ B			
TA2-A			
⊥ B			
TG3-A			
⊥ B			
TA3-A			
⊥ B	↓	↓	

Special instructions:

☒ Standard turn around time ☐ Rush by _____ date/time ☐ Other _____

☐ Fax results 781-247-4305

☐ **RETURN SAMPLES** ☐ Electronic transfer - datacoordinator@eheinc.com

☒ Additional report recipient ABISOL@EHEINC.COM

Each signatory please return one copy of this form to the above address

Relinquished by: _____ of Environmental Health & Engineering, Inc. Date: 4JUN24

Received by: _____ of (company name) _____ Date: 6/4/24

Relinquished by: _____ of (company name) AIL Date: 6/4/24

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data

Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: A.I.L.

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
CA 1-A	BULK	EPA 600/R-93/116	
↓ B	↓	↓	
Fc 1-A			
↓ B			
Fc 2-A			
↓ B			
Fc 3-A			
↓ B	↓	↓	
WGC 1-A			
↓ B			
WGC 2-A			
↓ B			
WGC 3-A			
↓ B			
WGC 4-A			
↓ B			

*Added from point count COC

d time ☐ Rush by _____ date/time ☐ Other _____

-4305

☐ Electronic transfer - datacoordinator@eheinc.com

pient ABISOL

Each signatory please return one copy of this form to the above address

Relinquished by: _____ of Environmental Health & Engineering, Inc. Date: 4 JUNE 24

Received by: _____ of (company name) _____ Date: 6/4/24

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data
Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email: mikemanning@asbestosidentificationlab.com

NVLAP® Testing Lab Code: 200919-0

Batch: 117756

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: PLM POINT COUNT

Dear Adam Bisol,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is PLM POINT COUNTThe information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.
Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Information provided by the customer can affect the validity of results. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. All customer information will be maintained in confidentiality. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Adam Bisol for your business.

Michael Manning
Owner/Director

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: PLM POINT COUNT

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
TSI1-A / 1302248			white	Non-Fibrous 83	**Detected** **Chrysotile 17**
TSI1-B / 1302249			white	Non-Fibrous 73	**Detected** **Chrysotile 27**
TSI1-C / 1302250			white	Non-Fibrous 75	**Detected** **Chrysotile 25**
TSI2-A / 1302251			gray	Non-Fibrous 75	**Detected** **Chrysotile 25**
TSI2-B / 1302252			gray	Non-Fibrous 72	**Detected** **Chrysotile 28**
CB 1-A / 1302253			multi	Non-Fibrous 84	**Detected** **Chrysotile 16**
CB 1-B / 1302254			multi	Non-Fibrous 82	**Detected** **Chrysotile 18**
WP 1-A / 1302255			white	Non-Fibrous 100	None Detected
WP 1-B / 1302256			white	Non-Fibrous 100	None Detected
WP 1-C / 1302257			white	Non-Fibrous 100	None Detected
WP 2-A / 1302258			gray	Non-Fibrous 100	None Detected
WP 2-B / 1302259			gray	Non-Fibrous 100	None Detected
WP 2-C / 1302260			gray	Non-Fibrous 100	None Detected
WP 3-A / 1302261			white	Non-Fibrous 100	None Detected
WP 3-B / 1302262			white	Non-Fibrous 100	None Detected
WP 3-C / 1302263			white	Non-Fibrous 100	None Detected

Sampled: May 29, 2024 **Received:** June 04, 2024 **Analyzed:** June 05, 2024

Friday 07 June 2024

Analyzed by: Michael Manning

Batch: 117756

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: PLM POINT COUNT

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
JC1-A 1302264			white	Non-Fibrous 100	None Detected
JC1-B 1302265			white	Non-Fibrous 100	None Detected
GB 1-A 1302266			white	Cellulose 2 Non-Fibrous 98	None Detected
GB 1-B 1302267			white	Cellulose 2 Non-Fibrous 98	None Detected
WP 4-A 1302268			gray	Non-Fibrous 100	None Detected
WP 4-B 1302269			gray	Non-Fibrous 100	None Detected
WP 4-C 1302270			gray	Non-Fibrous 100	None Detected
CP 1-A 1302271			multi	Non-Fibrous 100	None Detected
CP 1-B 1302272			white	Non-Fibrous 100	None Detected
CP 1-C 1302273			white	Non-Fibrous 100	None Detected
CP 2-A 1302274			gray	Non-Fibrous 100	None Detected
CP 2-B 1302275			gray	Non-Fibrous 100	None Detected
CP 2-C 1302276			gray	Non-Fibrous 100	None Detected
CP 3-A 1302277			white	Non-Fibrous 100	None Detected
CP 3-B 1302278			white	Non-Fibrous 100	None Detected
CP 3-C 1302279			white	Non-Fibrous 100	None Detected

Sampled: May 29, 2024 **Received:** June 04, 2024 **Analyzed:** June 05, 2024

Friday 07 June 2024

Analyzed by: Michael Manning

Batch: 117756

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: PLM POINT COUNT

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
CP 4-A 1302280			multi	Cellulose 5 Non-Fibrous 95	None Detected
CP 4-B 1302281			gray	Cellulose 5 Non-Fibrous 95	None Detected
CP 4-C 1302282			gray	Cellulose 5 Non-Fibrous 95	None Detected
TC 1-A 1302283			gray	Non-Fibrous 100	None Detected
TC 1-B 1302284			white	Non-Fibrous 100	None Detected
TC 1-C 1302285			white	Non-Fibrous 100	None Detected
CT 1-A 1302286			gray	Fiberglass 20 Mineral Wool 20 Cellulose 30 Non-Fibrous 30	None Detected
CT 1-B 1302287			gray	Fiberglass 20 Mineral Wool 20 Cellulose 30 Non-Fibrous 30	None Detected
CT 2-A 1302288			brown	Fiberglass 10 Mineral Wool 10 Cellulose 60 Non-Fibrous 20	None Detected
CT 2-B 1302289			brown	Fiberglass 10 Mineral Wool 10 Cellulose 60 Non-Fibrous 20	None Detected
CT 3-A 1302290			gray	Fiberglass 35 Mineral Wool 35 Cellulose 10 Non-Fibrous 20	None Detected
CT 3-B 1302291			gray	Fiberglass 35 Mineral Wool 35 Cellulose 10 Non-Fibrous 20	None Detected
JC 2-A 1302292			white	Non-Fibrous 100	None Detected
JC 2-B 1302293			white	Non-Fibrous 100	None Detected

Sampled: May 29, 2024 **Received:** June 04, 2024 **Analyzed:** June 05, 2024

Friday 07 June 2024

Analyzed by: Michael Manning

Batch: 117756

Adam Bisol
Environmental Health & Engineering, Inc.
180 Wells Ave
Suite 200
Newton, MA 02459

Project Information

26741

Method: PLM POINT COUNT

FieldID / LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
GB 2-A 1302294			gray	Cellulose 2 Non-Fibrous 98	None Detected
GB 2-B 1302295			gray	Cellulose 2 Non-Fibrous 98	None Detected

Sampled: May 29, 2024 **Received:** June 04, 2024 **Analyzed:** June 05, 2024

Friday 07 June 2024

Analyzed by: Michael Manning

Batch: 117756

Client: EHE Inc.

Address: 26741

Project Site & #:

Phone / email address:

Contact:

Relinquish by/date:

Received by/date: 6/4/24

# of Samples Received: 52

CHAIN OF CUSTODY

EPA/600/R-93/116

Asbestos Identification Lab
165 New Boston St.
Suite 227
Woburn, MA 01801
(781)932-9600
www.asbestosidentificationlab.com

Date Sampled:

BATCH# 117756

Rev 01/24

Page 1 of ~~10~~ 11

Turnaround Time		Sample Method	
☐	Less 3 Hrs	☒	Bulk
☐	Same Day	☐	Soil
☐	Next Day	☐	Wipe
☐	Two Day	☒	Point Count
☒	Three Day	☐	NOB

Stop on 1st Positive? Yes/No

Analyzed By: Jonathan Chan

Date: 6/6/24

Temp in Celsius = 23

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
1370224	TSI	Material						Chrysotile	17	W	P	+	L	N	1.558	1.551							
	1-A	Location	0	W	Y	F	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															83
59	TSI	Material						Chrysotile	27	W	P	+	L	N	1.558	1.551							
	1-B	Location	0	W	Y	F	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															73
60	TSI	Material						Chrysotile	25	W	P	+	L	N	1.558	1.551							
	1-C	Location	0	W	Y	F	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															75

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
51	TSI	Material						Chrysotile	25	W	P	+	L	N	1.558	1.551							
	2-A	Location	0	Gy	Y	F	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															75
52	TSE	Material						Chrysotile	28	W	P	+	L	N	1.558	1.551							
	2-B	Location	0	Gy	Y	F	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															72
53	WTC	Material						Chrysotile															
	1-A	Location						Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															
54	WTC	Material	VOID					Chrysotile															
	1-B	Location						Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															
55	WTC	Material						Chrysotile															
	2-A	Location						Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
53	CB	Material						Chrysotile	VL	W	P	+	L	N	1.558	1.551							
								Amosite															
								Crocidolite															
	1-A	Location	0	M	N	G	Y	Tremolite															
								Anthophyllite															
								Actinolite															84
54	CB	Material						Chrysotile	VL	W	P	+	L	N	1.558	1.551							
								Amosite															
								Crocidolite															
	1-B	Location	0	M	N	G	Y	Tremolite															
								Anthophyllite															
								Actinolite															82
55	WP	Material						Chrysotile															
								Amosite															
								Crocidolite															
	1-A	Location	0	W	Y	G	Y	Tremolite															
								Anthophyllite															
								Actinolite															100
56	WP	Material						Chrysotile															
								Amosite															
								Crocidolite															
	1-B	Location	0	W	Y	G	Y	Tremolite															
								Anthophyllite															
								Actinolite															100
57	WP	Material						Chrysotile															
								Amosite															
								Crocidolite															
	1-C	Location	0	W	Y	G	Y	Tremolite															
								Anthophyllite															
								Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
58 ~~60~~	WP 2-A	Material / Location	0	Gy	y	G	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
59 ~~61~~	WP 2-B	Material / Location	0	Gy	y	G	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
60 ~~62~~	WP 2-C	Material / Location	0	Gy	y	G	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
61 ~~63~~	WP 3-A	Material / Location	0	w	y	G	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
62 ~~64~~	WP 3-B	Material / Location	0	w	y	G	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100

Page 5 of 11

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
63 71	WP	Material						Chrysotile															
	3-C	Location	0	W	Y	G	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
64 72	JC	Material						Chrysotile															
	1-A	Location	0	W	Y	G	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
65 73	JC	Material						Chrysotile															
	1-B	Location	0	W	Y	G	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
66 74	GB	Material		W				Chrysotile															
	1-A	Location	0	W	Y	G	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															
67 75	GB	Material						Chrysotile															
	1-B	Location	0	W	Y	G	Y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															

4 4/6/21

Lab ID#	Cellulose	Non-Fibrous
71	R	
72	2	98
73	R	
74	2	98

Page 6 of 10/1

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
68 #6	WP 4-A	Material / Location	0	gy	y	f	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
69 #7	WP 4-B	Material / Location	0	Gy	y	f	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
70 #8	WP 4-C	Material / Location	0	Gy	y	f	y	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
71 #9	CP 1-A	Material / Location	0	B	N	g	g	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
72 #10	CP 1-B	Material / Location	0	W Gy	g	g	g	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100

4 G/6

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
23	CP	Material						Chrysotile															
	1-C	Location	0	W	5	5	5	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															6
24	CP	Material						Chrysotile															
	2-A	Location	0	5	5	5	5	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
25	CP	Material						Chrysotile															
	2-B	Location	0	5	5	5	5	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
26	CP	Material						Chrysotile															
	2-C	Location	0	5	5	5	5	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
27	CP	Material						Chrysotile															
	3-A	Location	0	5	5	5	5	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
78	CP 3-B	Material / Location	0	W	H	S	H	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
79	CP 3-C	Material / Location	0	M	N	S	H	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															100
80	CP 4-A	Material / Location	0	Gy	H	S/P	H	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															95
81	CP 4-B	Material / Location	0	Gy	H	S/F	H	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															95
82	CP 4-C	Material / Location	0	Gy	H	S/F	H	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															
								Actinolite															95

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
83	TC 1-A	Material / Location	0	W	H	S	F	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															L
								Anthophyllite															
								Actinolite															
84	TC 1-B	Material / Location	0	W	H	S	F	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															L
								Anthophyllite															
								Actinolite															
85	TC 1-C	Material / Location	0	W	H	S	F	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite															L
								Anthophyllite															
								Actinolite															
86	C+ 1-A	Material / Location	0	Gy	H	F	F	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite									2	1	R				
								Anthophyllite									20	2	30				3
								Actinolite															
87	C+ 1-B	Material / Location	0	Gy	H	F	F	Chrysotile															
								Amosite															
								Crocidolite															
								Tremolite									I	I	R				
								Anthophyllite									20	20	30				30
								Actinolite															

Page 11 of 11

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: ∥	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
88	CT 2-A	Material						Chrysotile									I	I	R				
		Location	0	Br	y	f	y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite									10	10	60				20
								Actinolite															
89	CT 2-B	Material						Chrysotile									I	I	R				
		Location	0	Br	y	f	y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite									10	10	60				20
								Actinolite															
90	CT 3-A	Material						Chrysotile									I	I	R				
		Location	0	gy	y	f	y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite									35	35	5				20
								Actinolite															
91	CT 3B	Material						Chrysotile									I	I	R				
		Location	0	gy	y	f	y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite									35	35	5				20
								Actinolite															
92	JC 2-A	Material						Chrysotile															
		Location	0	w	y	g	y	Amosite															
								Crocidolite															
								Tremolite															
								Anthophyllite															100
								Actinolite															

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = ____ / Material / Location	Stereo Scope: % of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Optical Properties: Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI: =	RI: ⊥	Non-Asbestos Percentage (%): Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
93	1 C 2-B	Material	0	4	4	4	4	Chrysotile															
								Amosite															
								Crocidolite															
		Location						Tremolite															
								Anthophyllite															5
								Actinolite															
94	GB 2-A	Material	0	96	4	4	4	Chrysotile															
								Amosite															
								Crocidolite											R				
		Location						Tremolite															
								Anthophyllite											2				98
								Actinolite															
1302295	GB 2-B	Material	0	96	4	4	4	Chrysotile															
								Amosite															
								Crocidolite											R				
		Location						Tremolite															
								Anthophyllite											2				98
								Actinolite															
		Material						Chrysotile															
								Amosite															
								Crocidolite															
		Location						Tremolite															
								Anthophyllite															
								Actinolite															
		Material						Chrysotile															
								Amosite															
								Crocidolite															
		Location						Tremolite															
								Anthophyllite															
								Actinolite															

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: ~~4~~ 30 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: ASBESTOS IDENTIFICATION LAB

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
TSI 1-A	BULK	EPA 600/R-93/116 POINT COUNT	
↓ B	↓	↓	
↓ C			
TSI 2-A			
↓ B			
WGC 1-A			
↓ B			
WGC 2-A			
↓ B			
WGC 3-A			
↓ B			
WGC 4-A			
↓ B			
CB 1-A			
↓ B	↓	↓	

moved to Bulk Button Per Adam

Special instructions:

☒ Standard turn around time ☐ Rush by _____ date/time ☐ Other _____

☐ Fax results 781-247-4305

☐ **RETURN SAMPLES** ☐ Electronic transfer - datacoordinator@eheinc.com

☒ Additional report recipient ABISOL@EHEINC.COM

Each signatory please return one copy of this form to the above address

Relinquished by: _____ of Environmental Health & Engineering, Inc. Date: 4 JUNE 24

Received by: _____ of (company name) _____ Date: 6/4/24

Relinquished by: _____ of (company name) AIC Date: 6/4/24

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data

Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: ASBESTOS IDENTIFICATION LAB

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
WP 1-A	BULK	EPA 600/R-93/116 POINT COUNT	
B			
C			
WP 2-A			
B			
C			
WP 3-A			
B			
C			
JC 1-A			
B			
GB 1-A			
B			
WP 4-A			
B			
C			

Special instructions:

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☐ Fax results 781-247-4305

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☒ Additional report recipient ABISOLA@EHEINC.COM

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Received by: _____ of (company name) _____ Date: 6/4/24

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data
Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: ASBESTOS IDENTIFICATION LAB

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
CP1-A	BULK	EPA600/R-93/116 POINT COUNT	
B			
C			
CP2-A			
B			
C			
CP3-A			
B			
C			
CP4-A			
B			
C			
TC1-A			
B			
C			

Special instructions:

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☐ Fax results 781-247-4305

☐ **RETURN SAMPLES** ☐ Electronic transfer - datacoordinator@eheinc.com

☒ Additional report recipient ABISOL

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Relinquished by: _____ of Environmental Health & Engineering, Inc. Date: 4 JUNE 24

Received by: _____ of (company name) _____ Date: 6/4/24

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data

Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: A.I.L.

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
CT1-A	BULK	EPA 600/R-93/116 POINT COUNT	
↓ B	↓	↓	
CT2-A			
↓ B			
CT3-A			
↓ B			

Special instructions:

☒ Standard turn around time ☐ Rush by _____ date/time ☐ Other _____

☐ Fax results 781-247-4305

☐ **RETURN SAMPLES** ☐ Electronic transfer - datacoordinator@eheinc.com

☐ Additional report recipient ABISOL

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Received by: _____ of (company name) _____ Date: 6/4/24

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data

Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

AEROBIOLOGY LABORATORY ASSOCIATES, INCORPORATED
A Pace Analytical® Laboratory

Telephone: 781-935-3212
Facsimile: 781-932-4857
Email: boston@aerobiology.net

Laboratory Report

Contact: Adam Bisol
Client: Environmental Health and Engineering Inc
Address: 180 Wells Avenue, Suite 200
Newton, MA 02459

Batch #: C 317719
Date received: 6/4/2024
Date analyzed: 6/10/2024
Date of report: 6/10/2024

AIHA-LAP, LLC Lab ID: 102754

Project # 26741
P.O.# N/A
Project Site: N/A

Lead Analysis In Paint Using SOP Based on SW846-7000B/3051
Results in weight percent on an "as received" weight basis

Lab ID	Client ID	Sample date	Description	Result	Reporting Limit	Comments
C 745079	Paint 1	5/29/24	Bulk Paint	<RL	0.014	
C 745080	Paint 2	5/29/24	Bulk Paint	4.16	0.028	
C 745081	Paint 3	5/29/24	Bulk Paint	2.49	0.047	

Qualification: RPD for the duplicate sample is outside of control limits. MS and all other QC is within recovery limits.

Sydney Strong, Technical Manager Chemistry
Aimee Cormier, Lab Director

Unless otherwise indicated, all samples were received in acceptable condition.
All results apply only to the samples tested and as received and are accurate to no more than three significant figures.
Unless otherwise indicated, all the quality control criteria for the method above have been met.
RL-Reporting Limit(% by weight) Note on units: mg/Kg is the same as ppm by weight.
RL-Reporting Limit; Defined as the lowest concentration the laboratory can accurately quantitate.
The Report shall not be reproduced except in full without the written approval of the laboratory.
Please visit our website at www.aerobiology.net for the current accreditation status.

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

DATE: 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

C317719

TO: AEROBIOLOGY

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	Lab ID: ~~OTHER:Time/Date/Vol.~~
PAINT 1	BULK	Pb BY AAS IN PAINT	743079
PAINT 2	↓	↓	80
PAINT 3	↓	↓	81

Special instructions:

☒ Standard turn around time ☐ Rush by _____ date/time ☐ Other _____

☐ Fax results 781-247-4305

☐ **RETURN SAMPLES** ☐ Electronic transfer - datacoordinator@eheinc.com

☒ Additional report recipient ABISSL@EHEINC.COM

Each signatory please return one copy of this form to the above address

Relinquished by: _____ of Environmental Health & Engineering, Inc. Date: 4 JUNE 24

Received by: Pamela Lampe-Loca of (company name) Aerobiology Date: 6/4/24 @15

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data
Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

Page 1 of 1

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

ANALYTICAL REPORT

Lab Number:	L2430684
Client:	Environmental Health & Engineering Inc. 180 Wells Ave. Newton, MA 02459
ATTN:	Adam Bisol
Phone:	(781) 247-4300
Project Name:	26741
Project Number:	26741
Report Date:	06/11/24

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Project Name: 26741
Project Number: 26741

Lab Number: L2430684
Report Date: 06/11/24

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2430684-01	FC1	SOLID	Not Specified	05/29/24 12:05	06/04/24
L2430684-02	FC2	SOLID	Not Specified	05/29/24 12:15	06/04/24
L2430684-03	FC3	SOLID	Not Specified	05/29/24 12:00	06/04/24

Project Name:	26741	**Lab Number:**	L2430684
Project Number:	26741	**Report Date:**	06/11/24

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Caitlin Walukevich

Title: Technical Director/Representative Date: 06/11/24

ORGANICS

PCBS

Project Name: 26741 **Lab Number:** L2430684

Project Number: 26741 **Report Date:** 06/11/24

SAMPLE RESULTS

Lab ID: L2430684-01
Client ID: FC1
Sample Location: Not Specified

Date Collected: 05/29/24 12:05
Date Received: 06/04/24
Field Prep: Not Specified

Sample Depth:
Matrix: Solid
Analytical Method: 1,8082A
Analytical Date: 06/11/24 07:23
Analyst: MHG
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3540C
Extraction Date: 06/09/24 17:30
Cleanup Method: EPA 3630
Cleanup Date: 06/10/24
Cleanup Method: EPA 3665A
Cleanup Date: 06/11/24
Cleanup Method: EPA 3660B
Cleanup Date: 06/11/24

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Polychlorinated Biphenyls by GC - Westborough Lab							
Aroclor 1016	ND		ug/kg	643	--	1	A
Aroclor 1221	ND		ug/kg	643	--	1	A
Aroclor 1232	ND		ug/kg	643	--	1	A
Aroclor 1242	ND		ug/kg	322	--	1	A
Aroclor 1248	ND		ug/kg	643	--	1	A
Aroclor 1254	ND		ug/kg	643	--	1	A
Aroclor 1260	670		ug/kg	643	--	1	A
Aroclor 1262	ND		ug/kg	643	--	1	A
Aroclor 1268	ND		ug/kg	322	--	1	A
PCBs, Total	670		ug/kg	322	--	1	A

Surrogate	% Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	78		30-150	A
Decachlorobiphenyl	80		30-150	A
2,4,5,6-Tetrachloro-m-xylene	76		30-150	B
Decachlorobiphenyl	73		30-150	B

Project Name: 26741 **Lab Number:** L2430684

Project Number: 26741 **Report Date:** 06/11/24

SAMPLE RESULTS

Lab ID: L2430684-02
Client ID: FC2
Sample Location: Not Specified

Date Collected: 05/29/24 12:15
Date Received: 06/04/24
Field Prep: Not Specified

Sample Depth:
Matrix: Solid
Analytical Method: 1,8082A
Analytical Date: 06/11/24 07:31
Analyst: MHG
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3540C
Extraction Date: 06/09/24 17:30
Cleanup Method: EPA 3630
Cleanup Date: 06/10/24
Cleanup Method: EPA 3665A
Cleanup Date: 06/11/24
Cleanup Method: EPA 3660B
Cleanup Date: 06/11/24

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Polychlorinated Biphenyls by GC - Westborough Lab							
Aroclor 1016	ND		ug/kg	602	--	1	A
Aroclor 1221	ND		ug/kg	602	--	1	A
Aroclor 1232	ND		ug/kg	602	--	1	A
Aroclor 1242	ND		ug/kg	301	--	1	A
Aroclor 1248	ND		ug/kg	602	--	1	A
Aroclor 1254	ND		ug/kg	602	--	1	A
Aroclor 1260	ND		ug/kg	602	--	1	B
Aroclor 1262	ND		ug/kg	602	--	1	A
Aroclor 1268	ND		ug/kg	301	--	1	A
PCBs, Total	ND		ug/kg	301	--	1	A

Surrogate	% Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	89		30-150	A
Decachlorobiphenyl	85		30-150	A
2,4,5,6-Tetrachloro-m-xylene	84		30-150	B
Decachlorobiphenyl	83		30-150	B

Project Name: 26741 **Lab Number:** L2430684

Project Number: 26741 **Report Date:** 06/11/24

SAMPLE RESULTS

Lab ID: L2430684-03
Client ID: FC3
Sample Location: Not Specified

Date Collected: 05/29/24 12:00
Date Received: 06/04/24
Field Prep: Not Specified

Sample Depth:
Matrix: Solid
Analytical Method: 1,8082A
Analytical Date: 06/11/24 07:38
Analyst: MHG
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: EPA 3540C
Extraction Date: 06/09/24 17:30
Cleanup Method: EPA 3630
Cleanup Date: 06/10/24
Cleanup Method: EPA 3665A
Cleanup Date: 06/11/24
Cleanup Method: EPA 3660B
Cleanup Date: 06/11/24

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Polychlorinated Biphenyls by GC - Westborough Lab							
Aroclor 1016	ND		ug/kg	647	--	1	A
Aroclor 1221	ND		ug/kg	647	--	1	A
Aroclor 1232	ND		ug/kg	647	--	1	A
Aroclor 1242	ND		ug/kg	324	--	1	A
Aroclor 1248	ND		ug/kg	647	--	1	A
Aroclor 1254	ND		ug/kg	647	--	1	B
Aroclor 1260	ND		ug/kg	647	--	1	B
Aroclor 1262	ND		ug/kg	647	--	1	A
Aroclor 1268	ND		ug/kg	324	--	1	A
PCBs, Total	ND		ug/kg	324	--	1	A

Surrogate	% Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	83		30-150	A
Decachlorobiphenyl	86		30-150	A
2,4,5,6-Tetrachloro-m-xylene	83		30-150	B
Decachlorobiphenyl	79		30-150	B

Project Name: 26741
Project Number: 26741

Lab Number: L2430684
Report Date: 06/11/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8082A
Analytical Date: 06/11/24 07:00
Analyst: MHG

Extraction Method: EPA 3540C
Extraction Date: 06/09/24 17:30
Cleanup Method: EPA 3630
Cleanup Date: 06/10/24
Cleanup Method: EPA 3665A
Cleanup Date: 06/11/24
Cleanup Method: EPA 3660B
Cleanup Date: 06/11/24

Parameter	Result	Qualifier	Units	RL	MDL	Column
Polychlorinated Biphenyls by GC - Westborough Lab for sample(s): 01-03 Batch: WG1931808-1						
Aroclor 1016	ND		ug/kg	662	--	A
Aroclor 1221	ND		ug/kg	662	--	A
Aroclor 1232	ND		ug/kg	662	--	A
Aroclor 1242	ND		ug/kg	331	--	A
Aroclor 1248	ND		ug/kg	662	--	A
Aroclor 1254	ND		ug/kg	662	--	A
Aroclor 1262	ND		ug/kg	662	--	A
Aroclor 1260	ND		ug/kg	662	--	B
Aroclor 1268	ND		ug/kg	331	--	B
PCBs, Total	ND		ug/kg	331	--	B

Surrogate	%Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	76		30-150	A
Decachlorobiphenyl	72		30-150	A
2,4,5,6-Tetrachloro-m-xylene	73		30-150	B
Decachlorobiphenyl	70		30-150	B

Lab Control Sample Analysis

Batch Quality Control

Project Name: 26741
Project Number: 26741

Lab Number: L2430684
Report Date: 06/11/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits	Column
Polychlorinated Biphenyls by GC - Westborough Lab Associated sample(s): 01-03 Batch: WG1931808-2 WG1931808-3									
Aroclor 1016	88		95		40-140	8		50	A
Aroclor 1260	91		98		40-140	7		50	A

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	81		89		30-150	A
Decachlorobiphenyl	83		89		30-150	A
2,4,5,6-Tetrachloro-m-xylene	77		84		30-150	B
Decachlorobiphenyl	75		80		30-150	B

Project Name: 26741
Project Number: 26741

Lab Number: L2430684
Report Date: 06/11/24

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	*Custody Seal*
A	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L2430684-01A	Glass 120ml/4oz unpreserved	A	NA		5.3	Y	Absent		PCB-8082-CAULK(365)
L2430684-02A	Glass 120ml/4oz unpreserved	A	NA		5.3	Y	Absent		PCB-8082-CAULK(365)
L2430684-03A	Glass 120ml/4oz unpreserved	A	NA		5.3	Y	Absent		PCB-8082-CAULK(365)

*Values in parentheses indicate holding time in days

Project Name:	26741	**Lab Number:**	L2430684
Project Number:	26741	**Report Date:**	06/11/24

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

Project Name:	26741	**Lab Number:**	L2430684
Project Number:	26741	**Report Date:**	06/11/24

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

Report Format: Data Usability Report

Project Name:	26741	**Lab Number:**	L2430684
Project Number:	26741	**Report Date:**	06/11/24

Data Qualifiers

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: Data Usability Report

Project Name: 26741 **Lab Number:** L2430684

Project Number: 26741 **Report Date:** 06/11/24

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Nonpotable Water: EPA RSK-175 Dissolved Gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Environmental Health & Engineering, Inc.

CHAIN OF CUSTODY FORM

LZ430084

DATE: 29 MAY 24

FROM: Environmental Health and Engineering, Inc.
180 Wells Avenue, Suite 200
Newton, MA 02459-3328

TO: ALPHA ANALYTICAL

Please send invoices to ATTN: Accounts Payable
Please send reports to ATTN: Data Coordinator

In all correspondence regarding this matter, please refer to EH&E Project # 26741

The cost of this analysis will be covered by EH&E Purchase Order # _____

For EH & E Data Coordinator - URGENT DATA ☐

SAMPLE ID	SAMPLE TYPE	ANALYTICAL METHOD/NUMBER	OTHER:Time/Date/Vol.
FC 1-A-~~B~~9	BULK	PCBs EPA 8082 W/ SOXHLET	5/29/24 1205
FC 2	1	1 EXTRACTION	5/29/24 1215
FC 3	1	1 1	5/29/24 1200

Special instructions:

☒ Standard turn around time ☐ Rush by _____ date/time ☐ Other _____

☐ Fax results 781-247-4305

☐ **RETURN SAMPLES** ☐ Electronic transfer - datacoordinator@eheinc.com

☐ Additional report recipient ABISOL@EHEINC.com

Each signatory please return one copy of this form to the above address

Relinquished by: _____ of Environmental Health & Engineering, Inc. Date: 4 JUNE 24

Received by: _____ of (company name) PTS Date: 6/4/24 1005

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Relinquished by: _____ of (company name) _____ Date: _____

Received by: _____ of (company name) _____ Date: _____

Lab Data
Received by: _____ of Environmental Health & Engineering, Inc. Date: _____

Page 1 of 1

WHITE-EH&E FILE COPY YELLOW-LAB COPY PINK-PROJECT MANAGER COPY GOLD-DATA COORDINATOR COPY

APPENDIX E

SAMPLE LOCATIONS